



Exploration & Production

GENERAL SPECIFICATION

SURVEYS

GS EP GEO 402

GIS Requirements for Field Development Project

00	01/2012	First Issue
Rev.	Date	Notes

Owner: DEV/TEC

Managing entity: DEV/TEC/GEO



Contents

1. Scope	3
1.1 Purpose	3
1.2 Field of application	3
2. Reference documents.....	3
3. Terminology.....	5
4. General Requirements.....	5
4.1 Detailed Engineering Layouts	5
4.2 3D models.....	10
4.3 Installation Schedules	10
4.4 Surveys and inspections	10
4.5 Final Documentation	10
5. Particular Requirements.....	10
5.1 GIS File formats.....	10
5.2 CAD file formats.....	11
5.3 Geodesy	11
5.4 Facility Data Model	11
5.5 Metadata.....	12
5.6 Associated documents Hyperlink	12
5.7 Data Quality Controls.....	13



1. Scope

1.1 Purpose

Company uses a Geographic Information System (GIS) to manage geographic or geo-referenced data during the Project execution.

Company updates the GIS with data from all packages in line with the following successive steps and operations of the Project:

- Basic & Detailed Engineering
- Construction, Transportation, and Installation
- Surveys and inspections
- Final Documentation.

Contractor shall therefore provide all geographic or geo-referenced data in a format compatible with Company's GIS. This document provides general and particular requirements for preparation, identification, control and delivery of geographic and geo-referenced data issued by Contractor to Company.

Geographic Data includes cartographic vector shapes (point, line, and polygon) or raster (elevation grid, images, etc...) positioned with coordinate geo-referenced into the Project planimetric and vertical coordinate systems or into a local coordinate system defined by Contractor.

Geo-referenced data are non geographic data associated to a geographic data using an identification key (ex: structure name or tag), ex: Attributes in tables, PDF reports, pictures, videos...

1.2 Field of application

This procedure applies to:

- All Package geo-referenced layouts or general arrangements issued during the detailed engineering (ex: Field Layout, FPSO Hull Deck Plot plan, etc...)
- Installation schedules
- Outputs from survey and inspection activities including any associated videos, pictures...
- As-built layouts provided as part of the Final Documentation.

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.

**Standards**

Reference	Title
Not applicable	

Professional Documents

Reference	Title
Not applicable	

Regulations

Reference	Title
Not applicable	

Codes

Reference	Title
Not applicable	

Other documents

Reference	Title
Not applicable	

Total General Specifications

Reference	Title
GS EP GEO 401	GIS requirements for engineering site surveys and studies
GS EP PJC 702	Requirements for electronic documents at project execution and field operations phases
GS EP PJC 703	Contractor FINAL DOCUMENTATION requirements

3. Terminology

Term	Definition
CAD	Computer-Aided Design
DMZ	Demilitarized Zone
ESRI	Developer of ArcGIS software
GIS	Geographic Information System
LBL	Long Base Line, acoustic positioning system
MDR	Master Document Register, file containing the list of all documents to be provided by Contractor
OLS	Offloading Line System, Engineering package name
OOL	Oil Offloading Line, Engineering package name
OLT	Offloading Line Terminal, Engineering package name
PGDB	Personal Geodatabase, ESRI GIS format
SPS	Subsea Production System, Engineering package name
UFR-SURF	Umbilical Flowline Riser / Subsea Umbilical Riser and Flowline, Engineering package name

4. General Requirements

4.1 Detailed Engineering Layouts

4.1.1 General

All layouts or general arrangements geo-referenced into the Project Coordinate System or into a local system shall be provided in GIS compatible format.

This includes for example the following documents:

- FPSO Mooring system layout, Pre-Installed Mooring Layout.
- UFR General Field Layouts
- Detailed Layouts or General Arrangements including SPS Contractor equipments (Risers, Flowlines, Gas Export line, OOLs, FLETs, ITAs, PLEM, SIV, spools and jumpers, umbilicals, Drill Centers, Production manifolds, Production and Water Injection wells, SDUs, Flying Leads, mooring systems, etc...)
- Pipelines and Umbilicals Alignments sheets
- LBL Array Layout
- OLT Mooring system layout, Pre-Installed Mooring Layout
- OLT layouts and General Arrangement in local OLT reference system

This requirement applies for all document revision issues and whatever the document Class (for Information, Review or Approval) or status (Design, Construction, As-Built...). The STATUS, DATE and REVISION of the native document shall be provided as attributes.

The documents required in GIS format shall be identified by Company from the Master Document Register issued by Contractor.

The conversion from CAD native format to GIS format shall be in line with section 5.1 requirements.

4.1.2 Data organization

Contractor shall provide data in both CAD and GIS formats. GIS data shall be organized in accordance with the nature of the layouts and also the features in the layouts.

Any Layout or General Arrangement is composed of the following features:

Table 1 - Layout features to be converted into GIS format

Contractor facilities	Symbol of the structures whose design and localization is under Contractor responsibility. These features shall be converted in GIS format.
Other facility	Symbol of the structures whose design is under the responsibility of another Contractor, but are displayed in the layout as it has interfaces with the Contract structures. These features shall be converted in GIS format.
Existing facilities	Symbol of the existing structures operated by Company. These features shall be converted in GIS format.
Annotations	The template block (containing the title block, notes, etc...) as well as the following in the map view: Grid, tips, north Arrow, Easting, northing Values, tables... shall not be converted into GIS format. The structures names, characteristics (pipeline curve radius...), the associated arrows, revisions marks (clouds, index, etc) ... shall be converted into GIS format. In addition, the site survey features (ex: bathymetry or topographic contours and associated labels, etc...) provided by Company, shall not be converted into GIS format.

Figures 1a and 1b shows 2 layouts provided by SURF Contractor and the features to be converted into GIS format as per the above table requirements.

In addition, CAD Layout shall be converted in accordance to the extent of the layout. The extent is:

- General: Field layouts covering the overall development area and parts, scales generally vary from 1:100 000 to 1:20 000, or,
- Detailed: layouts zoomed on drilling centers or pipeline/umbilical alignment sheets. Scales generally vary from 1:5 000 to 1:500.



GIS Data shall be classified into 4 feature data sets as defined in table 1:

- “LAYOUT”: annotation features classes, then organized as follows:
 - Limit: polygon feature class, containing all layout limits
 - Name: feature class containing layout names located at the bottom left
 - General layout: annotation and line features classes of general layouts
 - Detailed layout: annotation and line features classes of detailed layouts
- “CONTRACT”: Contractor facilities feature classes
- “EXISTING”: Existing facilities feature classes
- “OTHER”: other facilities feature classes.

The figure 2-a shows an example of GIS data organization to be adopted. Company will provide to Contractor after Contract award, the typical PGDB to be used.

In case Contractor issues several layouts at the same date, a unique GIS dataset shall be provided containing the overall layout features as per the latest update status. The Design features (Contract, Existing and Other facilities) won't be duplicated.

For layouts with Design and Construction status, only the following attributes are required:

- Facility or feature name
- Facility Tag, when available
- Document Source: layout reference + Rev + Status + Date

The final format of all data shall be agreed with Company at the start of the detailed engineering.

4.1.3 Data delivery

A project document number shall be defined and attributed to the GIS data, and shall be referred within the Contractor MDR. The PDF document in liaison within the MDR shall describe the GIS data and provide the references of the native documents transmitted together with the GIS data.

GIS data and references documents in PDF and CAD formats shall be provided to Company at the same date through the DMZ or using external drive.

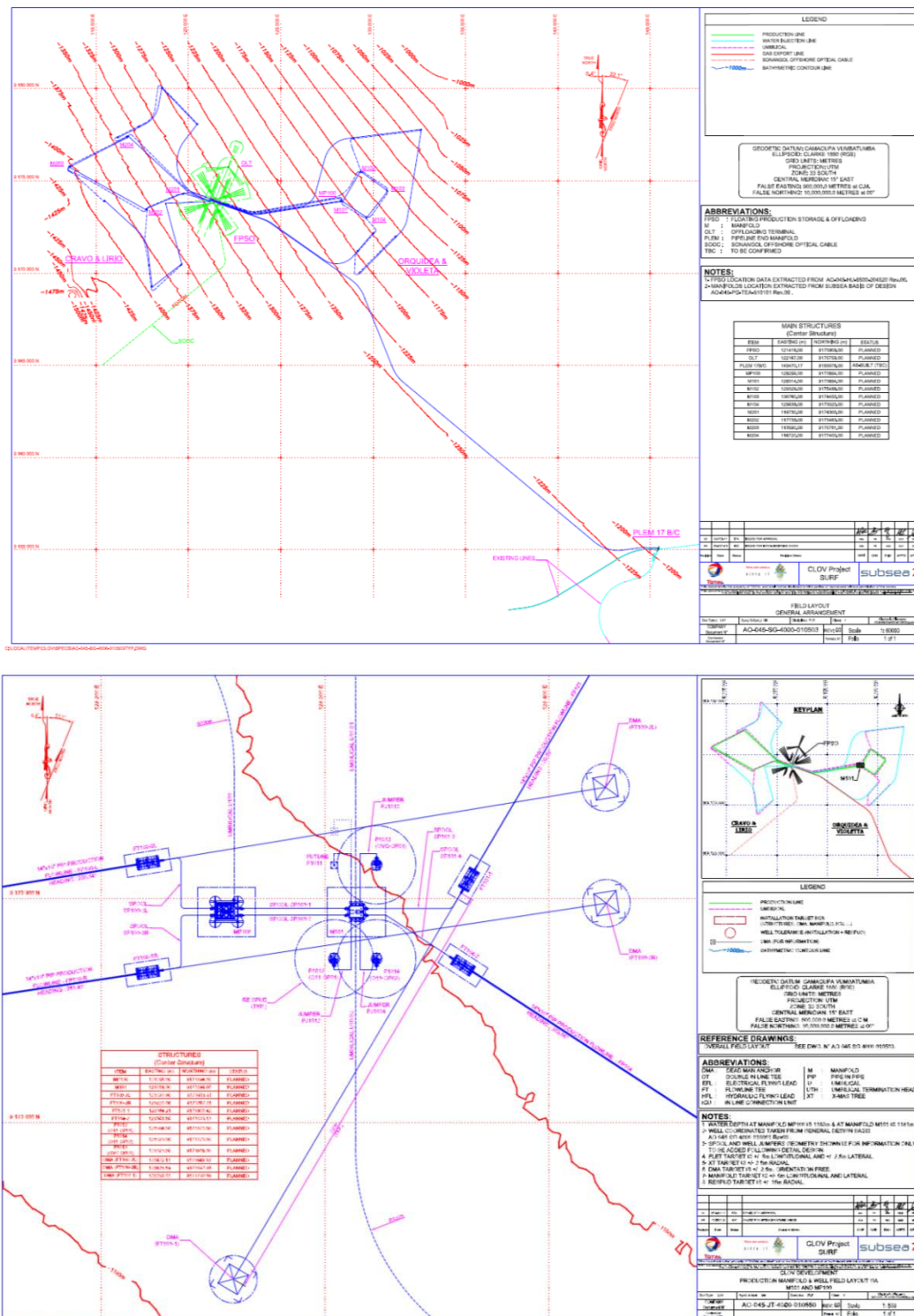


Fig. 1a & 1b - The features in the map view to be converted are shown in blue (Contract feature class), red (Other), cyan (Existing) and magenta (Layout). Features in red shall not be converted.

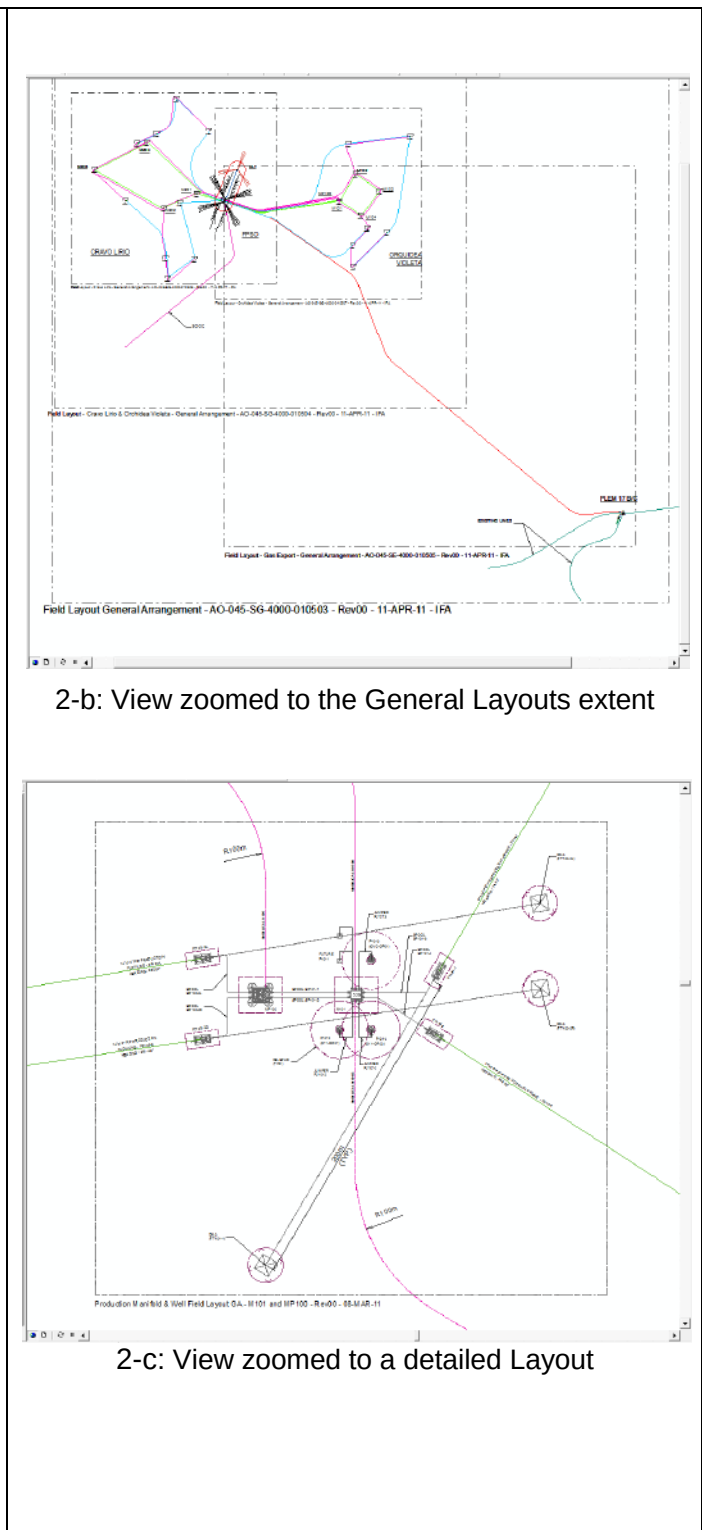
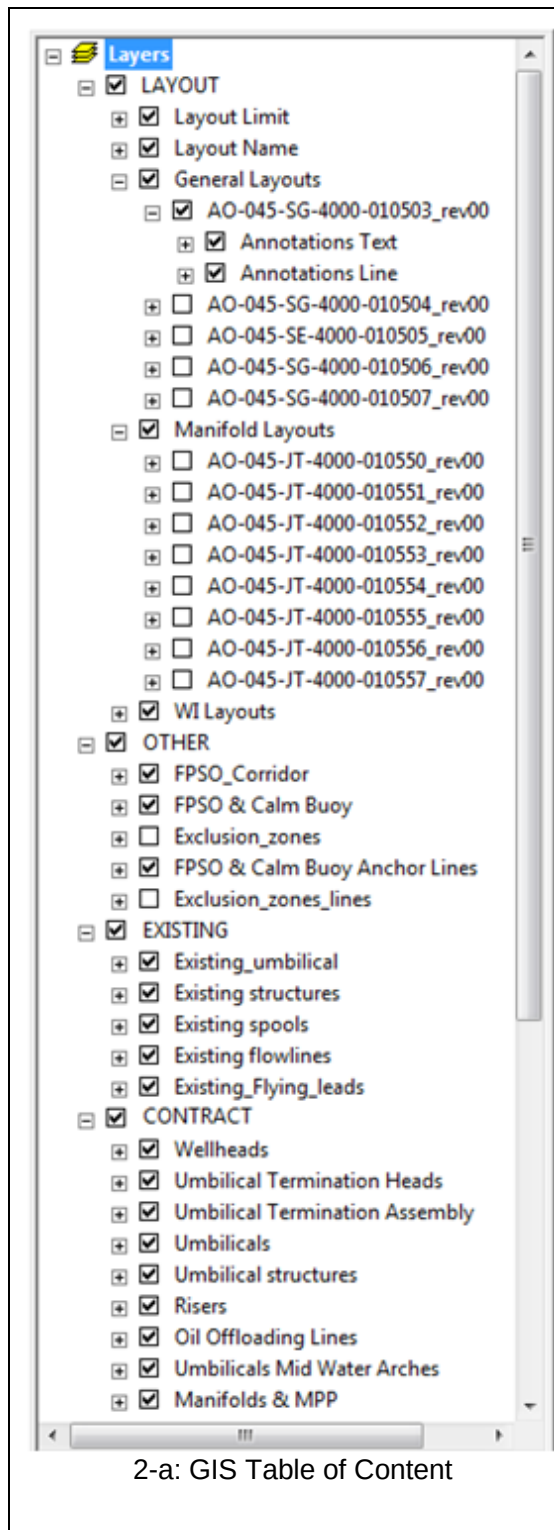


Fig.2 - Example of GIS feature classes organization and display



4.2 3D models

3D models of the FPSO, OLT, OOL or SURF systems shall be convertible into GIS or CAD formats.

4.3 Installation Schedules

Installation schedules, from level 2 status, shall be geo-referenced. This consists in associating each installation task to the facility or the geographic location impacted by the task.

A field named "location" shall be created in the schedule sheet and filled in with the facilities' names and/or tags when available, or location coordinates if the task cannot be attached to a facility.

4.4 Surveys and inspections

All survey data acquired by Contractor during the Project execution shall be provided to Company in GIS compatible format. This applies for example to:

- Additional engineering geophysical or geotechnical surveys
- Pre-lay , as-laid, as-built surveys
- ROV inspection survey (visual inspection, embedment, cathodic protection, etc.).

Data format shall comply with the **GS EP GEO 401**.

4.5 Final Documentation

As part of the Final Documentation, Contractor shall provide the overall as-built (ASB) field layout in GIS compatible format as per the Field Development Data model provided by Company before the end of the project.

All required attributes shall be extracted from the associated Design/As-built documentation and uploaded into the corresponding GIS tables.

In case of CAD use only, attributes shall be provided in an excel spreadsheet named as "Facility Tag_GIS_Datasheet.xls".

Company reserves the right to request any geographic data necessary to geo-reference documents not clearly identified in this specification.

The delivery of the As-Built GIS shall be performed as per **GS EP PJC 703**.

5. Particular Requirements

5.1 GIS File formats

The GIS native formats shall be:

- Raster files: Geotiff, or tiff, Jpg associated with *.tfw or *.jgw world file, and spatial index saved
- Vector files: ESRI Geodatabase (Personal, File, or ArcSDE) or ESRI shapefile (.SHP)
- Grid data: Digital Terrain Model, ASCII, Microsoft Excel files (etc.) with geodesy description appended.



If ESRI GIS format is used by Contractor, then Company will deliver an empty geo-database containing the datamodel to be used (XML file exported from ESRI ArcCatalog).

GIS data shall be compatible with ESRI ArcGIS Desktop 9.3.1 and ArcSDE 9.2.

CAD format shall remain the working and reference native format. All conversion works from CAD to GIS format shall be defined in a dedicated procedure and checked accordingly prior to be submitted to Company.

5.2 CAD file formats

CAD data shall be delivered in Autodesk AutoCAD files (.DWG, .DXF) or Bentley Microstation files (.DGN), software version as per **GS EP PJC 702**, for geographic data and excel format for attributes.

In the particular case of CAD format, the following rules shall apply:

- Spline, 3D face, shall not be used
- Layers shall contain only one feature type (polyline, or closed polyline, or point)
- Areas shall be delimited by a closed polyline
- External references shall not be used.

The CAD layers definition has to be submitted to Company for approval, before first delivery.

5.3 Geodesy

All files must be geo-referenced in the Project Coordinate Reference System specified in the Project Particular Specifications.

If ESRI geodatabase or shapefile are given, they must be delivered with the *.prj file. Company will provide the *.prj file prior to the beginning of the work.

If datasets are issued in CAD format, all geodetic parameters shall be indicated in the document.

If a layout uses a local system, its definition shall be clearly given and represented:

- Origin of local system
- Ox, Oy, Oz axis
- Units
- In degree between Local North and True North or Grid North, scale factor.

5.4 Facility Data Model

GIS datasets shall be structured as per the Field Layout Data model provided by Company after Contract award. For equipment / facility which is not specifically addressed in this document, Contractor shall submit datasets for Company approval.

All structures outlines shall be delivered as point, polygon or polyline features in geodatabase or shape file format with required metadata and attributes.

The center line representing linear facilities (pipelines, umbilicals, cables, mooring lines, etc....) shall be delivered as polyline with measures feature class in geodatabase or shapefile format.

The center line vertices shall contain KP values (m-values or “measures”) and Z values (i.e.: polyline ZM in ArcGIS).

Linear facilities shall be drawn with a unique feature per section, from equipment to equipment (ex: from FLET to FLET, etc.).

In both GIS and CAD delivery, each facility shall be identified with the name and Tag number if when available.

5.5 Metadata

All data imported in the GIS shall be traceable, meaning that it is possible to easily track the source and history of the data. This is achieved by ensuring the inclusion of the relevant metadata.

In addition to the attributes requirements given above, all GIS feature classes must contain the following attributes:

Table 2 - Metadata

Column name	Definition
Geometry_Source	Native document reference and revision
Document Title	Native document title
Document Revision	Native document revision
Document Date	Native document date
Document Status	Native document status
Contractor	Contractor name
Project	Project name
Geodesy	Datum and projection names
Conversion type	CAD GIS conversion method (manual, third software)
Conversion done by	Conversion works author name
Conversion Checked by	Conversion works checker name
Conversion Approved by	Conversion works Approver name

5.6 Associated documents Hyperlink

Any document, including multimedia files (pictures, movies, etc.), technical documents, etc. shall be delivered:

- Linked to a feature in the geodatabase or CAD (the document is named in an attribute named hyperlink, containing the relative path to the document)
- Or with an Excel file containing the coordinates for its localisation in the given coordinate system. This can be a point, a polyline, or a polygon.



5.7 Data Quality Controls

All data shall be checked and passed through Contractor's Quality Control System prior to be submitted to Company.

Conversion works from CAD to GIS formats shall be clearly identified into Contractor internal review process.

Contractor shall issue a dedicated procedure entitled "GIS Management Procedure" dealing with the creation, the update and the delivery of GIS data.