



Exploration & Production

GENERAL SPECIFICATION

PIPELINES - RISERS

GS PLR 001

Documentation requirements

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1. Scope

This General Specification represents the minimum requirements for the technical scope and quality management of the documentation related to the design of the pipeline system - further on referenced as the SYSTEM.

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
Not applicable	

3. Definitions

SYSTEM	Means the pipeline system, as specified by the CONTRACT and which shall be covered by the DESIGN .
DESIGN	Means the design studies for the SYSTEM and the associated organisation, in the frame of the CONTRACT .
Third Party	Means the company in charge of independent design appraisal or independent analysis or independent inspection in accordance with the CONTRACT .
Certifying authority	Means the company in charge of the certification of the SYSTEM and of issuing of the relevant certificates in accordance with the CONTRACT .
Battery Limits	Means the battery limits of the SYSTEM , as specified in the CONTRACT .
Component	Means any permanent or temporary component directly incorporated in the pipeline or any ancillary component which is needed for the construction, installation, and operation of the SYSTEM .

4. Deliverables

4.1 General documents

The **DESIGN** shall commence with the completion of:

- The GENERAL BASIS OF DESIGN document, that shall include:
 - the entire set of data to be used throughout the **DESIGN**, as per Appendix 1
 - the proposed design methods and criteria.
- The MASTER DOCUMENT REGISTER (MDR), covering the entire list of documents that shall be produced in the frame of the **DESIGN**; if the MDR extends beyond the **SYSTEM** (i.e. in the case of a Project involving the development of other facilities), the section of the MDR related to the **SYSTEM** shall be clearly identified in the frame of the global MDR.

These documents shall be approved before going further on in the **DESIGN**.

The **DESIGN** shall culminate with a definition of the **SYSTEM** in line with the accuracy level that is required since of the nature of the **DESIGN** (see 3).

4.2 Specific documents

The documents shall as a minimum consist of:

- | | |
|----------------------------|-----------------------|
| • general descriptions | • method statements |
| • general arrangements | • calculation notes |
| • technical specifications | • detailed procedures |
| • drawings | • alignment sheets |
| • material take-offs | • etc. |

as necessary for the following phases (as relevant):



- design
- fabrication
- expediting
- integration
- installation
- pre-commissioning
- operation
- inspection
- maintenance
- repair
- abandonment

As such, these documents shall cover:

- the description of the **SYSTEM** and its **Battery Limits**
- the criticality, safety, environmental, and functional assessments
- the sustained development assessment
- the interface matrix
- the structural / mechanical strength assessment
- the corrosion management assessment
- the site surveys and the associated results
- the qualification programs and tests
- the quality control and the acceptance procedures (studies, fabrication, installation)
- the as-built dossier.

4.3 Additional documents

In addition, the following documents may be incorporated, depending on the CONTRACT:

- the detailed procedures for commissioning and start-up,
- the complete operating manual,
- the contingency repair details, including the list of temporary and permanent means and systems.

4.4 Completion file

At the completion of the **DESIGN**:

- an approved DESIGN REPORT reflecting the requirements and principles stated in further 9
- an approved COMPLETION FILE - as outlined in further 10 - and covering all the documentation used and produced in the course of the **DESIGN**.

5. General requirements

5.1 Crossed references

Each referenced document, design data, analysis method, etc., listed in the GENERAL BASIS OF DESIGN shall receive an index number that shall be used in the frame of the DESIGN, and **necessarily** without having to duplicate the addressed information.



Therefore, each document produced in the frame of the **DESIGN** shall **commence** with the list of the crossed references, as necessary for the understanding of the said document.

In the case of drawings, these crossed references shall appear in the frame of the notes/comment box.

5.2 Electronic files

Each document used and produced in the frame of the **DESIGN** shall be available under an electronic format that shall be readable under PDF format, and in addition:

- formats used together with electronic output data shall be explained so as to enable their use together with other computer softwares than those used by the provider of these data or used in the course of the **DESIGN**.
- drawings and alignment sheets shall be recorded in the form of independent electronic files that shall be readable under a non-raster editing tool that shall allow any close-up views and printings at the required scale for each document, without any lost of accuracy, in the view of further checks and re-uses by COMPANY
- computer analysis spreadsheets and printouts shall be recorder in the form of independent electronic files that shall allow any extractions in the view of further checks and re-uses by COMPANY.

5.3 Units and accuracies

All calculations must be made with SI units.

Values not included in this system shall only be tolerated as references.

They shall be converted into SI values and shall not **at any time** be used in the calculations.

Any output data incorporated in the calculation notes and in the design report shall be reported at an accuracy level consistent with the design basis and design methods used for the **DESIGN**.

Stress levels shall be rounded up to the nearest megapascal.

End expansions shall be rounded up to the nearest tenths of meter.

Concrete coating thickness shall be rounded up to the nearest millimeter.

The use of inches is allowed for tubular sizes provided they are accompanied with the corresponding value in millimetres and tenths of millimetres.

The use of bars (absolute, gauge) is allowed too.

5.4 Computer modelling

All software packages, programs and sub-programs used shall have been previously tested and known to give fully validated and reliable results.

Any input data resulting from others - such as but not limited to loads and displacements limitations from any interfaced facilities - shall be documented in detail.

Furthermore, as long as such data are not available, the set of tentative values to be used for the purposes of the **DESIGN** shall be proposed.

On doing this, it shall be demonstrates that the degree of conservatism used is consistent with the expectable behaviour of the interfaced facility.



As soon as the outstanding information is available, the model and analyses performed shall be updated accordingly.

For any type of calculation or analysis performed on computer, the complete and detailed computer outputs shall be submitted together with the analysis report.

The computer input and output data shall be accompanied by sketches which shall perfectly match the computer model, especially in terms of joint and node numberings.

The code checking results outputs shall indicate the reference of the code formula for each usage factor printed and summarised code checking results shall also be given in decreasing order.

Any Usage Factors found to exceed **80%** of the maximum allowable values shall be clearly reported.

At the end of the **DESIGN**, the computer model shall be updated to represent the **approved for tendering**, or the **approved for construction**, or the **as-built** condition of the SYSTEM, as applicable.

6. Analyses

Each analysis shall:

- commence with the crossed references and a summary of the main findings, recommendations, and issues
- include a synthesis of the results in the form of drawings or sketches, with check on determinant conditions
- include a copy of the drawings showing the modelled components
- include any hand calculation performed during the structural analysis at data input stage or as complementary verification or code check.

7. Drawings and alignment sheets

The alignment sheets as well as any detailed drawings shall be prepared on the basis of the GENERAL BASIS OF DESIGN, and of the survey results.

Each alignment sheet shall be implemented according to the following requirements:

- a key plan shall be incorporated as necessary to clearly locate the concerned item along the pipeline route
- the coordinates shall be based on UTM Coordinate System and the bathymetric data shall be based on reference level system which shall be clearly reported in the drawings
- local elevations shall be determined from a known fixed reference and references to sea-bottom level shall be avoided unless a specified permanent reference frame is available
- the **Battery Limits** shall be clearly identified and marked-up with assumptions/holds made, as necessary
- the pipeline characteristics table, including the variable characteristics related to the plan view such as steel thicknesses, steel grades, coatings, burial, freespan, etc., shall be reported in full

- any plane views - at 1/5000, 1/10000 or 1/20000 typical scales - shall include the isobaths, the kilometric points and their UTM coordinates, the tangent points and curve radii and their UTM coordinates, the soil conditions, the temporary and the permanent obstacles, and any other points of special interest
- any elevation views - at vertical scale between 1/100 and 1/500 - shall be documented with clear relation to their corresponding plane views.

Any series of drawings to be prepared in the view of detailed engineering, procurement, fabrication, assembly and installation of specific components, sections, and sub-assemblies, shall be accompanied with:

- a drawing list, including structural weight for each drawing of the list, which shall be updated at each issued revision of any referenced drawings
- a 3D structural general arrangement drawing
- a general note drawing
- typical welding detail drawings.

8. Material Take Offs (MTOs)

MTOs shall enable to:

- procure line pipes, coatings, weightings, permanent and temporary components and aids, sub-assemblies, etc.
- calculate installation, abandonment, and recovery weight loads for regular pipelaying operations, as well as for specific deployment, abandonment and recovery of special components (i.e. bulkheads, PLETs, tapplings, branchings, incorporated valves, ...).

Each MTO shall be established drawing by drawing and element by element.

Summaries shall be made for each sub-assembly.

Lengths and cross-sections taken into account shall be those calculated on the drawings, including those of bends and major fittings.

The weights of components, sub-assemblies, and sub-systems shall be taken into account and the hypothesis made by shall be clearly traceable, until these weights have been confirmed.

Each MTO shall also provide the hypothesis and quantities used for the contingency spares, segregated per destination (NDT, installation, EPRS, etc.).

9. Design report

The DESIGN REPORT is a fundamental deliverable that shall be initiated at the commencement of the **DESIGN** and that shall be steadily implemented and updated, as necessary.

At the end of the **DESIGN**, the DESIGN REPORT shall outline the main findings and conclusions.

Any **changes** that may have occurred along the **DESIGN** shall be duly documented, with their chronological sequences.

The DESIGN REPORT shall as **a minimum** contain the following sections:

Executive summary	outline of the main hypothesis and findings
Design Data	the tables as per Appendix 1.
Pipeline Summary	the tables as per Appendix 2.
Reference documents	the list of all Reference documents used, with outline of main amendments, if any.
Process	outlines of hypothesis, assessment method and findings, with specific flow management and thermal assurance issues, and P&IDs, as necessary.
HSE	outlines of safety, and environmental design principles, including external risks as well as risks induced by the SYSTEM .
Routing	outlines of hypothesis, assessment method and findings, supplemented with A4 and/or A3 formatted maps showing out the overall layout and bathymetry, and enlarged details of terminations, special points, as necessary.
Corrosion	outlines of corrosion prevention/mitigation design, including coatings, cathodic protection, internal linings, and injection of chemicals.
Line pipe selection	outlines of hypothesis, assessment method and findings, based on pressure containment, resistance to external pressure, and resistance to installation loads.
In-place stability	outlines of hypothesis, assessment method and findings in relation with the in-place behaviour of the SYSTEM , including concrete coating, trenching, burying, free span limitation, lateral and upheaval buckling, etc.
Installation	outlines of pipelaying methods and associated marine vessels, and installation aids, including initiation, termination, abandonment and recovery phases.
Tie-ins	outlines of terrestrial and subsea tie-ins design, fabrication and site works, with main impact from / consequences to / the interfaced facilities.
Special points	outlines of design, site preparation works and installation works.
Material Take-Offs	outlines of the main quantities, lengths, unit weights (in air, submerged) per specified component, item, sub-assembly, etc.
Precommissioning	outlines of precommissioning activities, such as cleaning, hydrotesting, leak tests, and preservation methods until the commissioning/start-up phase.
Inspection, Maintenance and Repair	outlines of recommendations in the view of in-service inspection and maintenance, and of an Emergency Repair System, if required.

At the completion of the **DESIGN**, the GENERAL BASIS OF DESIGN document can be merged into the DESIGN REPORT.

10. Completion file

At the end of the **DESIGN**, a completion file shall be provided in both paper and CD-ROM formats, which shall comprise the following types of documents, as applicable:

- the Master Document Register
- the Design Plan and associated QA/QC plan
- the DESIGN REPORT, which shall comprise the Design Data and the Pipeline Summary
- the GENERAL BASIS OF DESIGN, if not merged into the DESIGN REPORT
- the Risk and Environmental Management Plan
- the P&IDs and PCFs
- the interface documentation (if applicable)
- the Design Review meeting notes
- the Third Party documentation
- the progress reports
- the Project schedules at different levels
- the derogation dossiers
- the pre-survey specifications and procedures, as necessary for the detailed engineering phase
- the detailed design including the hydraulic and thermal analysis, the in-place and installation strength analyses, with their computer outputs
- the detailed material take-offs, as necessary for the procurement phase
- the procurement, fabrication, and assembly procedures for any components, materials, sub-systems incorporated in the Pipeline System, including their associated data sheets, inspection, quality control, integration tests, site acceptance tests, as-built documentation
- the route maps and elevation profiles, and the associated detail drawings, as necessary for the site preparation works and installation works
- the procedures and associated detailed documentation for the site preparation works
- the installation procedures, including navigation, positioning, anchoring, special points, tie-ins, and their associated contingency procedures
- the precommissioning (and commissioning, if applicable) procedures and associated detailed documentation
- the Operating Manual (if applicable)
- the Emergency Pipeline Repair System (if applicable)
- the as-built dossier / DFI résumé, if applicable

11. PLR Database

At the end of the detailed design, all data shall be made available so as to allow the completion of the Pipeline and Riser data base (PLR Database).



Appendix 1 Design data sheets

Soil conditions (****)	
Type of soil	
Mechanical characteristics of soil	
Vertical soil friction	
Horizontal soil friction	
Top layer thicknesses	
Topography / Bathymetry / Bottom roughness	
Maximum and minimum water depths	
Soil hazards (slides, pockmarks, boulders, faults..)	
Earthquakes	
Ocean conditions	
Ice	
Breaking wave regions	
Current corridors, loop currents	
Minimum and maximum water temperature (**)	
Salinity & Density (**)	
Fauna and flora (**)	
Visibility (**)	
Sea states	
Current tables (*) (**)	
Wave tables (*)	
Scatter diagrams	
Mean tide	
Spring / neap / equinox tides	
Water rise/fall (*)	
Meteorological conditions	
Winds/gusts (*)	
Minimum and maximum air temperature	
Atmospheric pressure	
Minimum Visibility	
Floating Production Unit conditions	
Position tolerances	
Static and dynamic offsets for all conditions	
Dimensions, drafts	
RAO's	
Reference point for motion definition	
Mooring pattern and details of mooring lines	
Other site conditions	
Location of existing works	
Cable or pipeline crossings	
Obstacles	
Sea traffic lanes	
Fishing areas	
Local regulations	
Particular regulations (***)	
(*) : at applicable return periods (1yr, 10yrs, etc ...) and along the 8 main directions (**) : at various depths from surface to sea bottom (***) : preservation of the environment / sensitive ecological area (****) : to be completed for all types of soil encountered along the route	



Fluid properties	
Type (liquid, gas, polyphasic,...)	
Composition	
Density (**)	
Viscosity (**)	
Dew Point	
Specific heat (**)	
Thermal conductivity (**)	
Wax formation and deposition temperatures	
Hydrate curves (P,T)	
Process flow characteristics	
Nominal flowrate	
Maximum operating pressure	
Maximum tolerance of pressure limiting system	
Extreme / Incidental pressure	
Pressure profile envelopes	
Temperature profile envelopes	
Temperature and pressure cycles	
Cool-down condition : min. temp. / max. duration	
Warm-up condition : flow, duration	
Works	
Function	
Origin / Destination / Length	
Pipeline bore diameter	
Pipeline wall thickness & associated tolerances	
Service life	
Hydrotest Pressure	
Type of work at either ends	
Access, constrains, interface requirements at either ends	
Provisions for anticipated developments	
Route layout and accessibility	
Scope of provision	
Connection to other works	
Dropped object risks	
Anticipated piggings, with nature	
Through pipeline intervention	
Periodicity of scheduled shutdowns	
Specific recommendations	
Internal lining	
External lining - insulation	
Internal roughness	
Inspection methods	
(*) Any expected variation along the intended service life shall be documented accordingly. (**) In general these data depend on the fluid composition, pressure and temperature. Tabulated values shall be documented accordingly.	



Appendix 2 Pipeline summary

1 - OVERALL SITE MAP AND DETAIL DRAWINGS IN A3 OR A4 FORMAT

these maps shall also outline any existing surface and subsea facilities being connected or not to the Pipeline System, as well as the main navigation issues.

2 - GENERAL INFORMATION

General References

client's reference	country, project title, subtitles, reference, ...
description	function, fluid
type of development	indicate new pipeline system, or requalified, or else

Design basis

local rules and regulations	indicate also reference document(s) on agreed
prime references	amendments, if applicable

Outline pipeline system

overall length	
reference grid and covered area	indicate UTM reference used
minimum and maximum water depths	along route, wrt reference sea level
departing from/ arriving at	name and nature of facilities
constant diameter	precise also if constant by OD or by ID
number of sections	one section per change in pipeline definition see further tables '3' for cross-sectional description

Outline operating conditions

service life	
specified pressure levels	indicate types and values
temperature requirements	minimum and maximum values
cooldown and warm-up times	if applicable
preservation means	by circulated dead oil, by heating, ..., if applicable
paraffin and/or hydrate prevention means	
overall safety system (HIPPS, valving, ...)	
pigging requirements	indicate operational, intelligent, and specified frequencies

Outline installation

Pipelaying method	indicate laying method and marine vessels used
Tensioning/towing loads	indicate allowable and attained values
Route curvature radius	indicate minimum allowable radius

Outline corrosion protection



3 – CROSS SECTIONAL DESCRIPTION : from KP <..> to KP <..>

A new section shall be created upon any change in:

- sub-system (ex: riser, spool, pipeline)
- cross-sectional definition
- change of pipelaying mode

Alternatively:

- a table showing out as many columns as required by a change in the cross-sectional definition can be used when the number of property/specification changes is low.
- specific datasheets shall be tailor made in such cases as flexible jumpers, bundle strings, special points, etc.

As a minimum, each layer shall be described as follows:

Description	Inner layer		K th layer		Outer layer
From KP to KP					
Function					
Material					
Thickness					
Density					
Thermal expansion factor					
Thermal conductivity					
Heat capacity					
Bonding mode to adjacent layer below					
Bonding mode to adjacent layer above					
Mechanical strength					
Dry weight					
Submerged weight					
Range of allowable temperatures					
Exposure to (sea)water (allowed/prohibited)					
Access for IM&R					

4 - MATERIAL TAKE-OFFS

MTOs shall be segregated in a traceable way with respect to each variation in the cross-section, and also as necessary for the other components, materials, sub-systems to be incorporated in the Pipeline System.

5 - TERMINATIONS OF A MAJOR SUB-SYSTEM OF THE PIPELINE SYSTEM

Examples of typical terminations: upper riser end to piping section, bottom riser end (spool) to pipeline section, flexible jumper to pipeline section, rigid jumper ends to pipeline and to subsea unit, etc.

Condition	Upstream termination	Downstream termination
Position (XYZ)		
Connection method		
Max. allowable loads		
Max. allowable displacements		
Retrievability means/requirements		