

GENERAL SPECIFICATION

SUBSEA SYSTEMS

GS EP SPS 034

Well Jumper Design

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1. Scope

This Specification defines the minimum design and functional requirements for the design, fabrication and testing of subsea well jumpers.

This document gives guidance on the design of both rigid and flexible jumpers.

The jumpers defined in this document are relevant to those found grouped in templates, cluster linked into manifolds or connected to an In Line Tee (ILT) for Production and Injection jumpers.

Small bore lines in piggy back on the main pipe, are part of the jumper, and have to be taken into account for the design.

This specification does not apply to:

- A “spool” defined as pipe section that connects a FLET or a FLET-tee to another structure
- A “riser base spool defined as a pipe section that connects the bottom assembly of a riser to the following adjacent structure (FLET or SSIV module).

2. Reference documents

This specification shall be read in conjunction with the **GS EP SPS 001**.

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
API RP 1111	Design, construction, operation and maintenance of offshore hydrocarbon pipelines (limit state design)
ASME B31.3	Process Piping
ASME B31.4	Pipeline Transportation Systems for Liquids and Slurries
ASME B31.8	Gas transmission and distribution piping systems
DNV-OS-F101	Submarine pipeline systems
DNV-RP-C203	Fatigue Design of Offshore Steel Structures
DNV-RP-F112	Design of Duplex Stainless Steel Subsea Equipment exposed to Cathodic Protection

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Total General Specifications

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

Reference	Title
GS EP COR 232	Composite/Syntactic foam used for buoyancy modules for permanent subsea applications
GS EP COR 560	Physical and chemical treatment of hydrostatic test water
GS EP EXP 311	Plant integrity - Minimum inspection requirements
GS EP GEO 701	Geotechnical Design Considerations for Soil-Pipeline Interaction
GS EP PLR 100	Submarine pipeline systems
GS EP PLR 109	Design, fabrication and testing of submarine unbounded flexible pipes and risers
GS EP POS 002	Subsea positioning works
GS EP SPS 001	Subsea Production Systems General Design Requirements
GS EP SPS 007	Subsea Connection Systems
GS EP SPS 008	Thermal insulation of subsea stations
GS EP SPS 009	Corrosion protection of subsea stations
GS EP SPS 012	Documentation requirements for subsea stations
GS EP SPS 027	WORO spread minimum requirements
GS EP SPS 029	Metallic Materials for Subsea Production Facilities
GS EP SPS 033	Subsea Intervention Tooling
GS EP SPS 038	Subsea Structures design & fabrication

3. Terms and Definitions

Company	Total E&P
Vendor	The party(s) which manufactures and/or supplies materials, equipment, technical documents/drawings and services to perform the duties specified by Company.
Contractor	Contractor appointed by the Company for the supply of the equipment.
'Shall'	'Shall' is used to indicate requirements which are to be strictly followed in order to conform to the specification and acceptance by all parties.
'Should'	'Should' is used to indicate that among several possibilities one is the recommended as particularly suitable without mentioning or excluding others, or that a certain course of action is preferred but not necessarily required.

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- ‘May’** ‘May’ is used to indicate a course of action permissible within the limits of the specification. An optional course of action.
- ‘Can’** ‘Can’ is used for statements of possibility and capability, whether material, physical or capable.

3.1 Abbreviated Terms

BOP	Blow Out Preventer
CP	Cathodic Protection
CRA	Corrosion Resistant Alloy
EFAT	Extensive Factory Acceptance Test
FAT	Factory Acceptance Test
FIV	Flow Induced Vibration
FLET	Flow Line End Termination
GTAW	Gas Tungsten Arc Welding
HCP	Hydrostatic Crush Pressure
HISC	Hydrogen Induced Stress Cracking
IBL	Instrumented Buoyancy Loss
ILT	In Line Tee
IMR	Inspection Maintenance Repair
ITP	Inspection Test Plan
OD	Outside Diameter
MBR	Minimum Bend Radius
MOP	Maximum Operating Pressure
MPFM	MultiPhase Flow Meter
MSV	Multi-purpose Support Vessel
ND	Nominal Diameter
PGB	Production Guide Base
PPS	Project Particular Specification
ROV	Remote Operated Vehicle
RPCM	Ring Pair Corrosion Monitor
SCF	Stress Concentration Factor
SSIV	Sub Service Isolation Valve

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SWT Shallow Water Test
VIV Vortex Induced Vibration
XT Christmas Tree

4. Well jumper description

The jumpers defined in this specification cover the following field layout scenarios:

- Well jumpers connecting Christmas Trees (XTs) to a manifold span between two (almost) fixed structures.
- Well jumpers connecting a XT to an ILT. Only the XT end is almost fixed and the ILT may be subject to large displacements due to pipeline expansion / lateral buckling, and large installation tolerances.
- Where well jumpers are required in a template, the jumper will span a pre-defined geometry within the template structure and will be comparatively short and as a consequence rigid.

5. Well Jumper design and functional Requirements

5.1 Functional Requirements

The well jumpers and associated appurtenances as small bore lines in piggy-back, shall be designed in accordance with the following functional requirements:

- Ensure the flow continuity.
- Comply with flow assurance requirements.
- Comply with IMR requirements.
- Resist all applicable loads.
- Provide sufficient flexibility to ensure the force required to deform the jumper is within the host structure and connector capacities. For subsea connection system requirements refer to the [GS EP SPS 007](#).
- Accommodate all expansion/displacement loads.
- Allow connection / disconnection to XT's and to the structure (ILT / Manifold).
- Be retrievable to surface or wet stored on subsea support.
- For XT re entry the jumper shall not be removed and shall not interfere with BOP.
- Specified instrumentation, including but not limited to, Multi Phase Flow Meters (MPFM), Ring Pair Corrosion Monitors (RPCM) and sand detectors are not recommended and shall be discussed case by case before final approval by Company.

5.2 General Design Requirements

All well jumpers shall be designed in accordance with the following minimum requirements:

- All jumpers shall be designed for the field life with no plan for repair or maintenance.

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- b) Jumpers shall be designed to accommodate both seawater and fluid(s) they are designed to transport.
- c) The jumpers shall be designed to sustain all conditions they may encountered during field life. This includes (but is not limited to) fabrication, load out, transportation, storage, installation, normal operating conditions, incidental conditions, transient conditions like depressurization, pre-commissioning (including but not limited to leak test at the end of field life), shutdown and restart, accidental events (including but not limited to dropped objects, trawl impact, ROV impact).
- d) The jumper shall accommodate the loads due to connector stroking during connection, disconnection and re-connection.
- e) Unless otherwise stated, the jumper shall be designed to sustain external pressure at maximum water depth, with internal atmospheric pressure.
- f) All metrology tolerances shall be incorporated in the jumper design.
- g) Fabrication tolerances shall be proposed by Contractor for Company review and approval.
- h) Fabrication tolerances of adjacent structures to which the jumper is connected shall be considered also. The jumpers shall be designed to accomodate all fabrication tolerances.
- i) The jumper shall be designed to accommodate flowline ILT displacements.
- j) Where Production Guide Bases (PGBs) are to be used, the jumper shall be designed to be wet parked on the PGB prior to XT installation and connection. Misalignment tolerances between PGB and XT shall be taken into consideration.
- k) The design of jumpers shall cater for combinations of positioning and installation tolerances of the subsea structures (XT, manifold, ILT) including, but not limited to heading, pitch, roll, lateral and longitudinal tolerances as defined in the **GS EP POS 002** section 3. Combinations shall be approved by Company. Accuracy of the metrology system shall be factored into the design.
- l) In any case, installation tolerances of the structures supporting the tie-ins at each side of the production jumper shall not be cumulated when the installation of the last one is performed relatively to the existing one.
- m) The jumpers shall be designed not to exceed allowable loads of structure connectors and inboard porch (including guidance structure).
- n) Jumper design shall allow disconnection from the host structure to enable manifold module or XT retrieval.
- o) The design shall include all required appurtenances such as anti-VIV devices (where required), anodes, anti-corrosion coating, protections, supporting structures. All design and subsequent analysis shall be subject to Company approval.
- p) A specific jumper design accommodating potential well re-spudding event shall be studied. Re-spud location shall be 15 m radially from the existing well. In exceptional cases this requirement could be modified (minimum distance is 12 m), but subject to Company approval.