

DEP SPECIFICATION

DEEPWATER COLLET TYPE CONNECTOR SYSTEMS

DEP 37.81.40.35-Gen.

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DESIGN AND ENGINEERING PRACTICE



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1. INTRODUCTION

1.1 SCOPE

This new DEP specifies minimum requirements and gives recommendations for the design, testing, interfacing, and operation of subsea collet connectors and accessory equipment. In this context, the term “collet connectors” refers to all types of connectors using locking segments or fingers and a drive ring for engagement. It is the purpose of this specification to define functional, operational, testing and interface requirements.

The scope of this DEP covers more components related to connector integration into subsea structures and jumpers than just the connectors themselves. In some cases, the Contractor may not supply all those components and thus the sections of this DEP relevant to those components may not apply.

The Contractor is encouraged to bring to the Principal's attention any variations from this specification which might reasonably improve performance, economy, or might increase utilization of standard, proven products and services.

Project specific requirements will be provided within a separate specification (Scope of Supply, Basis for Design, or Data Sheet) that shall be issued for each project. The DEP Informative provides an example data sheet for project use.

This DEP replaces former Deepwater standard DEP 37.81.40.35-EPP dated March 2006.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by Shell GSI, the distribution of this DEP is confined to Shell companies and, where necessary, to Contractors and Manufacturers/Suppliers nominated by them. Any authorised access to DEPs does not for that reason constitute an authorization to any documents, data or information to which the DEPs may refer.

This DEP is intended for use in facilities related to subsea oil and gas production. Application in other facilities may also apply.

When DEPs are applied, a Management of Change (MOC) process should be implemented; this is of particular importance when existing facilities are to be modified.

If national and/or local regulations exist in which some of the requirements could be more stringent than in this DEP, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable with regards to the safety, environmental, economic and legal aspects. In all cases the Contractor shall inform the Principal of any deviation from the requirements of this DEP which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned, the objective being to obtain agreement to follow this DEP as closely as possible.

1.3 DEFINITIONS

1.3.1 General definitions

The **Contractor** is the party that carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party that manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party that initiates the project and ultimately pays for it. The Principal may also include an agent or consultant authorised to act for, and on behalf of, the Principal.

The word **shall** indicates a requirement.

The word **should** indicates a recommendation.

1.3.2 Specific definitions

Term	Definition
Connector system	The term “connector system” used herein shall mean the actuated mechanical connector and related accessories required for its function. This includes the male hub, female connector assembly, alignment guides, anchor flanges, soft landing cylinders, flowline connection structures at the flowline sleds and/or tie-in manifold, line pipe, metal-to-metal seal ring, test seal, fluid coupling for actuation and connector function and seal pressure test, etc. The hydraulic actuators for connector make-up may remain with the system, or may be recovered with a separable running tool.
Accessory hardware	The term “accessory hardware” used herein shall mean tools, equipment or materials required for the mounting, operation and testing of the installed connector system. This includes the male end closures, female end closures, seal removal and replacement tools, ROV interface panel (including hydraulic manifold(s) and tubing) for connector actuation, jumper fabrication jigs, measurement caps, trash caps, any tools used to run or make up the connection and seal test equipment.

1.3.3 Abbreviations

CRA	Corrosion Resistant Alloy
FAT	Factory Acceptance Testing
NDE	Non Destructive Examination
PLET	Pipeline End Termination
ROV	Remote Operated Vehicle
SIT	System Integration Test

1.4 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made, the referenced section number is shown in brackets (). Other documents referenced by this DEP are listed in (8).

1.5 SUMMARY OF MAIN CHANGES

This DEP is a revision of former Deepwater standard DEP 37.81.40.35-EPP dated March 2006. The following are the main, non-editorial changes.

Old section	New section	Change
1.	1.	Section revised to align with DEP-Gen. standards
1.1	1.1	Scope expanded to include a broader range of collet-type connectors, including horizontal connectors. Also addressed in DEP-Informative.
2.2	2.2	Dropped object impact standard added, along with provision for project specific standards for dropped object and ROV impact requirements.
2.3		This section was omitted since electrical and hydraulic distribution systems are not part of the connector system. They are addressed briefly in the DEP-Informative.
3.	3.	Requirement for connector bending capacities exceeding the strength of the attached flowline pipe changed to requirement to exceed maximum design load cases. DEP Informative addresses this topic.

Old section	New section	Change
3.1.1	3.2.2	Mechanical lock requirements of the latching mechanism clarified.
3.1.1	3.2.2	Eliminated requirement that override release mechanism accommodate all connector sizes used in a job. Also addressed in DEP Informative (4.3).
3.1.1	3.2.2	Added requirement that female end sealing surface be CRA.
3.1.2	3.2.3	Reference added to DEP 37.81.40.31-Gen. for welding.
3.4	4.1	Eliminated requirement that type 1 seal functionality (as defined in the former document) not have a metal seal ring. Also addressed in DEP Informative.
3.4	4.1	Added functionality to specifically address flood caps.
3.4.1	4.1.2	Added material and cathodic protection requirements for caps intended for long term use.
3.7	3.2.2	Added requirement for soft landing system to pull the hubs together.
3.9.1	4.2.2	Requirement to allow seal change out using only the soft landing system changed to recommendation.
3.10.1	3.6.2	References changed from API 17D and API 17H to ISO 13628-1, ISO 13628-8, and the Principal's specification for ROV interfaces.
3.11	3.7	Added requirement specifying external seal test pressure as 310 bar (4500 psi) for 3 min and 15 min during FAT.
3.12	2.4	Changed cathodic protection reference document to DEP 30.10.73.32-Gen.
3.15	4.4	Added requirement for stands allowing seal inspection and replacement.
3.16	5.3	Alternative dynamic load factor allowed, if supported by analysis and agreed to by the Principal.
3.17	3.8	Insulation standard changed to DEP 37.81.41.36-Gen. Alternate insulation allowed if qualified to DEP 37.81.41.37-Gen.
4.	6.	Added requirements for connector to comply with ISO 13628-1, ISO 13628-4, and ISO 10423 PSL 3 and Appendix F PR2. For components that are part of a tree, DEP 37.80.00.36-Gen. Materials required to comply with DEP 39.01.10.12-Gen.
4.5	6.4	Cathodic protection standard changed to DEP 30.10.73.32-Gen.
4.7		Section eliminated. Specification requirements addressed in other sections. Access to fabrication and testing addressed in DEP Informative.
4.8.1	6.6.2	Added specific requirements for design qualification testing.
4.8.2	6.6.3	Added specific requirements for Factory Acceptance Testing.
4.8.3		Removed section on System Integration Testing, addressed in DEP-Informative, Section 6.6.4..
	8.	Reference section added to align with DEP-Gen. standards.
	Appendix A, in DEP-Informative	Added section to assist in defining project requirements.

1.6 COMMENTS ON THIS DEP

Comments on this DEP may be sent to the Administrator at standards@shell.com, using the DEP Feedback Form. The DEP Feedback Form can be found on the main page of “DEPs on the Web”, available through the Global Technical Standards web portal <http://www.shell.com/standards> and on the main page of the DEPs DVD-ROM.

1.7 DUAL UNITS

This DEP contains both the International System (SI) units, as well as the corresponding US Customary (USC) units, which are given following the SI units in brackets. When agreed by the Principal, the indicated USC values/units may be used.

2. GENERAL AND FUNCTIONAL REQUIREMENTS

2.1 GENERAL REQUIREMENTS

The Contractor shall design, manufacture and test the collet connector systems and accessory hardware in accordance with the following basic design philosophies.

The Contractor's system design shall be based on the use of equipment with a proven subsea service record in the project environment. Reference should be made to the field data contained in the project specification documents. The Contractor shall provide a fully detailed list of previous projects utilizing the equipment as proposed by the Contractor for this project.

The quantity and complexity of subsea components installed shall be minimized and simple solutions shall be offered to enhance reliability and reduce the need for maintenance and repair throughout field life, as much as is practical.

The Contractor shall have responsibility for ensuring that the connector system and accessory hardware meet the minimum requirements as set forth in this DEP. In particular, the Contractor shall:

- a) Perform the appropriate and required engineering, design, and analysis of the connector system to meet the requirements of this specification. This is to include structural analysis, piping analysis, a complete stack-up tolerance analysis, and an ROV access analysis, as described in (6).
- b) Prepare all fabrication and assembly drawings, bills of materials, manufacturing specifications (materials, welding, heat treatment, etc.), assembly and test instructions, and installation and operation & maintenance (O&M) procedures.
- c) Procure all materials, parts, and sub-assemblies, and provide all labour, tools, and equipment required for fabrication, assembly and testing of the connector system.
- d) Perform testing of the connector system, including design qualification testing, prototype testing, Factory Acceptance Testing (FAT), and System Integration Testing (SIT) as required.
- e) Prepare the connector system for shipment. This is to include necessary clean up and refurbishment of the equipment after the FAT, including preservation fluids, coatings, handling, and interim storage.
- f) Provide the necessary support, including equipment test fixtures, jigs, testing spares, etc. for performing the required FAT of the connector system. This also is including engineering and technical support services as required during SIT to rectify any problems, or to make modifications to the connector system as required.

In addition, the Contractor shall have primary responsibility for:

- Developing designs to insure that the connector system and mating components can be positively and repeatedly aligned subsea.
- Considering all interfaces and coordinating all interface information concerning the connector system. The connector system shall work in conjunction with, and interface with, other, mating equipment systems.

2.2 FUNCTIONAL REQUIREMENTS

The Connectors will be used to make permanent metal-to-metal sealed subsea connections between flowlines, trees, and manifolds. Use of these connections may include rigid pipe spools, flexible pipe spools, or hard piped modules.

Jumper spools or hard piped modules will be lowered to the connection points at the seafloor. The male hubs and guide funnel receivers shall be mounted on the connection structures on the flowline PLETs, trees and/or manifold and shall contain no moving parts. The female connector assembly of the connector system shall be mounted on the jumper spool or hard pipe module.