API[®] Monogram[®] Equipment

Purchase API Spec 17D online at www.api.org/publications

API Specification

17D

2nd Edition, May 2011

Specification for Design and Operation of Subsea Production Systems—Subsea Wellhead and Tree Equipment ISO 13628-4 (Identical), Design and operation of subsea production systems—Part 4: Subsea wellhead and tree equipment

Table of Contents

1.0 Product Description

- 1.1 Products
- 1.2 Subsea Tree Equipment
- 1.3 Subsea Wellhead Equipment
- 1.4 Tubing Hanger System Equipment
- 1.5 Mudline Suspension System Equipment
- 1.6 Drill Through Mudline Suspension System Equipment
- 1.7 Miscellaneous Equipment

2.0 Purchaser's Responsibility

- 2.1 Material Class
- 2.2 Material Selection
- 2.3 Data Sheets
- 2.4 Operating Loads

3.0 Design Requirements

- 3.1 Miscellaneous Equipment
- 3.2 Non-Covered Equipment
- 3.3 Actuators
- 3.4 Subsea Tree Equipment
- 3.5 Control Interface
- 3.6 Connectors
- 3.7 Chokes

4.0 Testing Requirements

- 4.1 Subsea Tree Equipment
- 4.2 Subsea Tree Assemblies
- 4.3 Subsea Tree Piping
- 4.4 Subsea Tree Control Interfaces

5.0 Storage and Preservation Requirements

- 5.1 Subsea Tree Equipment
- 5.2 Subsea Tree Control Interfaces

6.0 Shipping Requirements

6.1 Subsea Tree Equipment

7.0 Documentation Requirements

1.0 Product Description

Specification 17D includes the following requirements for product ordered and may be applicable in addition to any product-specific requirements listed in other sections identified herein:

1.1 PRODUCTS

1.1.1

API Specification 17D - Introduction

This guide is not intended to inhibit a vendor from offering, or the purchaser from accepting, alternative equipment or engineering solutions for the individual application. This can be particularly applicable where there is innovative or developing technology. Where an alternative is offered, it is the responsibility of the vendor to identify any variations from this Specification and provide details.

1.1.2 API Specification 17D – Annex J.1

Level 1 identifies possible chemical and or physical changes in selected materials. Level 1 is intended to provide general information that can be published by either chemical suppliers and/or manufacturers. Level 2 looks for chemical and/or physical changes in non-metallic materials, such as swelling, when the material resides in a confined space. Level 2 testing also uses more specific concentrations and operating conditions defined by the end user for a particular application. Level 2 results are likely to be proprietary and project-specific and might not necessarily be directly comparable to other published level 2 data. Level 3 is an in-depth test to determine the useful operating life of non-metallic materials in the presence of the additive using accelerated-life-estimation testing procedures based on the Arrhenius principle.

1.1.3 API Specification 17D – Annex M.1

Annex M provides recommended guidelines for inquiry and purchase of equipment covered by this part of ISO 13628. Annex M is informative; however users may, by agreement between the interested parties, consider the provisions to be either requirements or guidelines. This is especially the case when determining PSL.

1.1.4 API Specification 17D – Annex M.3

PSLs are defined in 5.2 and 5.3, and in ISO 10423. PSLs apply to pressure-containing and pressure-controlling parts and assembled equipment as defined in this part of ISO 13628. Determination of the PSL is the responsibility of the purchaser. Selection of PSL can depend on whether equipment is primary or secondary equipment, as defined in ISO 10423. For this part of ISO 13628 primary equipment shall include, as a minimum, the tubing head/high-pressure housing, the first two actuated (master and/or wing) valves downstream of the tubing hanger, the lower tree connector, and any other flowline or isolation valve in direct communication with the well bore upstream of the second actuated valve.

1.1.5 API Specification 17D – Annex M.3

- PSL 2: recommended for general (non-sour) service at working pressure 34,5 MPa (5 000 psi) and below; recommended for secondary equipment for working pressure of 69 MPa (10 000 psi) or below;
- PSL 3: recommended for primary equipment in sour service, all working pressures, and general service above pressures of 34,5 MPa (5 000 psi); recommended for primary and secondary equipment, sour or general service, for pressures above 69 MPa (10 000 psi) or for maximum temperature ratings above 121 °C (250 °F).
- Other considerations that can lead the user to consider PSL 3 over PSL 2 include water depth, composition of retained or

injected fluids, field infrastructure, difficulty of intervention, acceptance of risk, sensitivity of environment, and useful field life.

 PSL 3G: same recommendations as for PSL 3, with additional considerations for wells that are gas producers, have a high gas/oil ratio or are used for gas injection.

1.1.6 API Specification 17D – Annex M.3

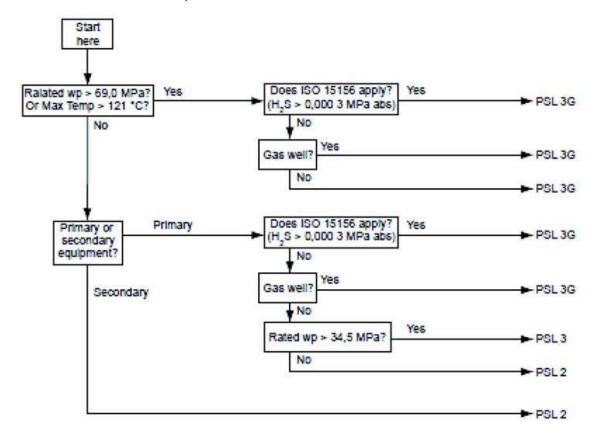


Figure M.1 — PSL decision tree for subsea equipment

1.1.6 API Specification 17D – Annex N

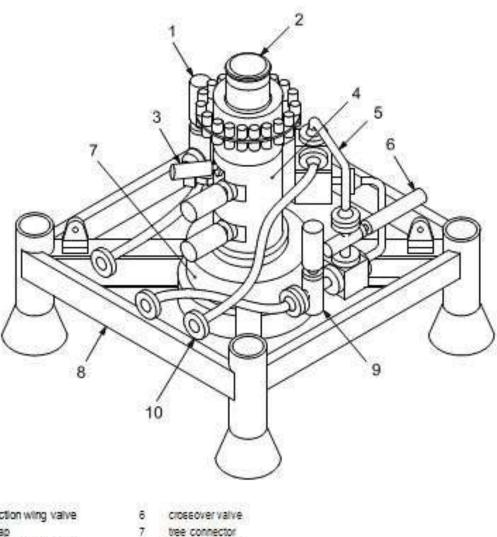
The use of the Monogram on products constitutes a representation and warranty by the Licensee to purchasers of the products that, on the date indicated, the products were produced in accordance with a verified quality management system and in accordance with an API product specification.

1.2 SUBSEA TREE EQUIPMENT

1.2.1 API Specification 17D – 1. Scope Subsea trees:

- tree connectors and tubing hangers
- valves, valve blocks, and valve actuators
- chokes and choke actuators
- bleed, test and isolation valves
- TFL wye spool
- re-entry interface
- tree cap
- tree piping
- tree guide frames
- tree running tools
- tree cap running tools
- tree mounted flowline/umbilical connector
- tubing heads and tubing head connectors
- flowline bases and running/retrieval tools
- tree mounted controls interfaces (instrumentation, sensors, hydraulic tubing/piping and fittings, electrical controls cable and fittings)

API Specification 17D - Annex A 1.2.2

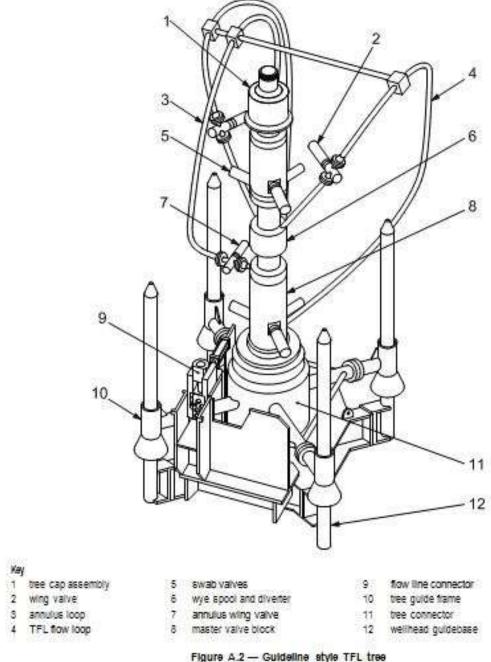


- production wing valve
- production swab valve
- master valve block
- 5 flow loop

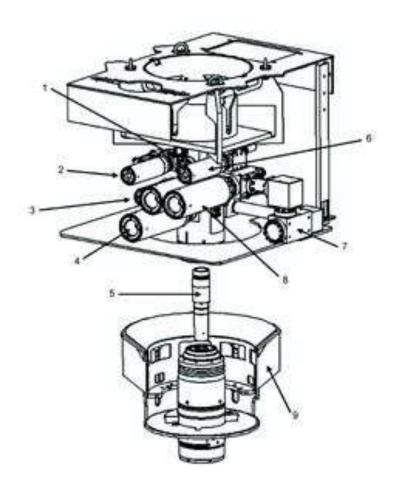
- tree guide frame
- annulus wing valve
- flow line connection

Figure A.1 — Guideline style vertical tree

API Specification 17D - Annex A 1.2.3



1.2.4 API Specification 17D – Annex A



Yay
1 swab valves
2 annulus wing valve
3 annulus master valve
4 master valve

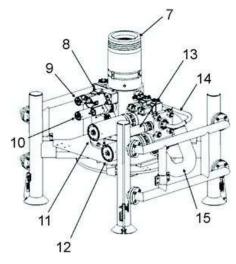
5 tubing hanger 6 crossover valve 7 production outlet 8 wing valve

9 GRA, CGB, or tubing head

Figure A.3 - Guidelineless style vertical tree

1.2.5 API Specification 17D – Annex B

Common names for individual components are included in the numbered key. The two items not identified are the casing hangers (blue) and tree (yellow).



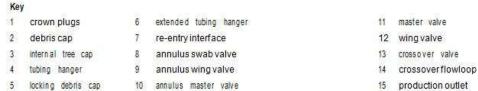
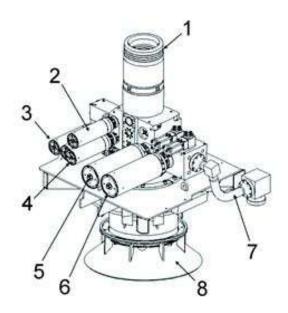


Figure B.1 — Guideline style horizontal tree

1.2.6 API Specification 17D – Annex B



- 1 re-entry interface
- 2 annulus swab valve
- 3 annulus wing valve
- 4 annulus master valve
- 5 master valve
- 6 wing valve
- 7 production outlet
- guidelineless re-entry funnel (funnel down)

Figure B.2 — Guidelineless style horizontal tree

1.3 **SUBSEA WELLHEAD EQUIPMENT**

API Specification – 1. Scope Subsea wellheads:

- conductor housings
- wellhead housings
- casing hangers
- seal assemblies
- quidebases
- bore protectors and wear bushings
- corrosion caps

1.3.2 API Specification 17D - Annex C

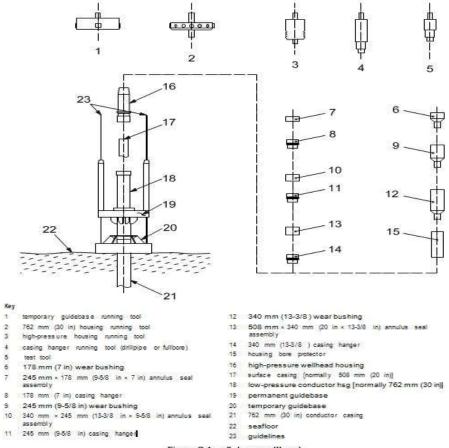
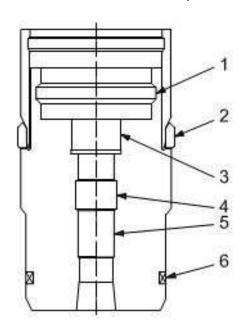


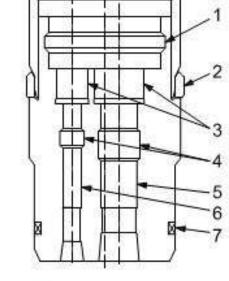
Figure C.1 — Subsea wellhead

1.4 TUBING HANGER SYSTEM EQUIPMENT

- **1.4.1** API Specification 1. Scope Tubing hanger systems:
 - tubing hangers
 - running tools

1.4.2 API Specification 17D – Annex D





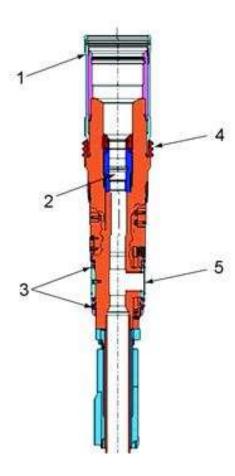
- 1 running tool latching groove
- 2 lockdown
- 3 stab sub seal pockets
- 4 wireline plug profiles
- 5 production bore
- 6 seal

- Key
 1 running tool latching groove
 2 lockdown
 3 stab sub-sort peckets
- 3 stab sub seal pockets
- 4 wireline plug profiles 5 production bore
- 6 annulus bore
- 7 seal

Figure D.1 — Concentric tubing hanger

Figure D.2 — Tubing hanger with multiple bores

1.4.3 API Specification 17D – Annex D



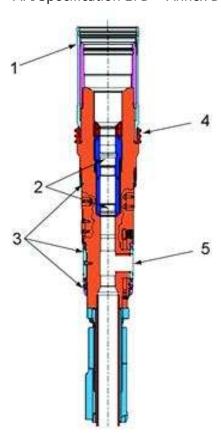
Common names for individual components are included in the numbered key. The two items not identified are the casing hangers (blue) and tree (yellow).

- 1 running tool latching groove
- 2 wireline plug profile or closure device
- 3 seal
- 4 lockdown
- 5 production outlet

Figure D.3 — Tubing hanger for horizontal tree

1.4.4

API Specification 17D - Annex D



Common names for individual components are included in the numbered key. The two items not identified are the casing hangers (blue) and tree (yellow).

- 1 running-tool latching groove
- 2 wireline plug profile or closure devices, two
- 3 seal
- 4 lockdown
- 5 production outlet

Figure D.4 — Extended tubing hanger for horizontal tree

1.5 MUDLINE SUSPENSION SYSTEM EQUIPMENT

L.5.1 API Specification – 1. Scope Mudline suspension systems:

- wellheads
- running tools
- casing hangers
- casing hanger running tool
- tieback tools for subsea completion
- subsea completion adaptors for mudline wellheads
- tubing heads
- corrosion caps

1.5.2 API Specification 17D – Annex E

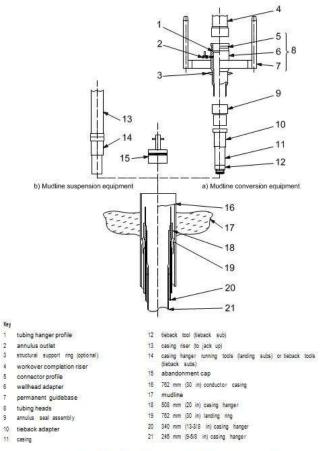
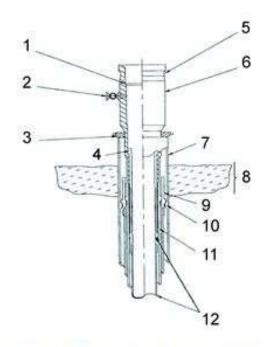
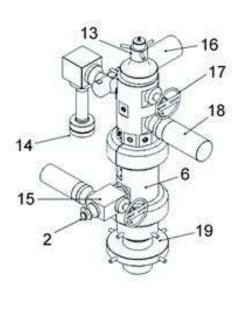


Figure E.1 — Mudline suspension (wellhead) and conversion equipment

1.5.2 API Specification 17D – Annex E





a) Mudline conversion equipment (installed)

Subsea tree on a mudline suspension conversion

Key tubing hanger profile mudline casing hanger, 340 mm (13-3/8 in) 2 annulus outlet 12 mudline casing hanger, 245 mm (9-5/8 in) structural support ring (optional) 3 13 tree cap casing hanger tieback adapter production outlet 5 connector profile 15 annulus valves tubing head wing valve conductor casing, 762 mm (30 in) swab valve 17 mudline 8 18 master valve mudline casing hanger, 508 mm (20 in) 19 mudline conversion 10 mudline landing ring, 762 mm (30 in)

Figure E.2 — Mudline conversion equipment

1.6 DRILL THROUGH MUDLINE SUSPENSION SYSTEM EQUIPMENT Description:

1.6.1 API Specification – 1. Scope

Drill through mudline suspension systems:

- conductor housings
- surface casing hangers
- wellhead housings
- casing hangers
- annulus seal assemblies
- bore protectors and wear bushings
- abandonment caps

1.6.2 API Specification 17D – Annex E

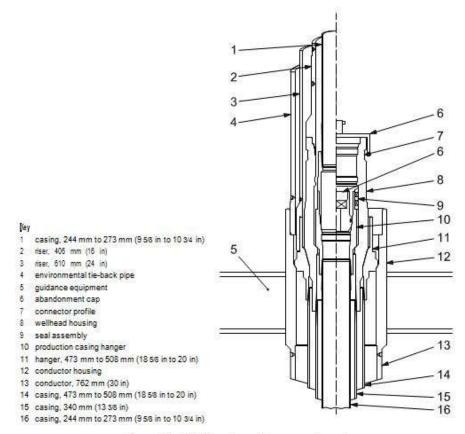


Figure F.1 — Drill-through mudline suspension system

1.7 MISCELLANEOUS EQUIPMENT

Description: API

API Specification – 1. Scope Miscellaneous equipment:

- flanged end and outlet connections
- clamp hub-type connections
- threaded end and outlet connections
- other end connections
- studs and nuts
- ring joint gaskets
- guideline establishment equipment

2.0 Purchaser's Responsibility

2.1 MATERIAL CLASS

2.1.1 API Specification 17D – 4.1.4

Choosing material class and specific materials for specific conditions is ultimately the responsibility of the purchaser.

2.1.2 API Specification 17D – 4.1.5

It is the responsibility of the end user to specify materials of construction for pressure-containing and pressure-controlling equipment. Material classes AA-HH as defined in Table 1 shall be used to indicate the material of those equipment components. Guidelines for choosing material class based on the retained fluid constituents and operating conditions are given in Annex M.

2.1.3 API Specification 17D – Annex M.4

Material-class manufacturing requirements are given in ISO 10423 and in Table 1. Material class shall be determined by the purchaser with consideration to the various environmental factors and production variables listed below:

- a) pressure;
- **b)** temperature;
- **c)** composition of produced or injected fluid, particularly H2S, CO2, and chlorides;
- d) pH of water phase or brine;
- e) exposure to salt water during installation or operation;
- f) use of inhibitors for scale, paraffin, corrosion or other reasons;
- **g)** possibility of acidizing and concentration of acidizing solutions;
- h) anticipated production rates;
- i) sand production and other potential for erosion;
- j) anticipated service life;

k) future operations that can affect pressure, temperature or fluid content;

I) risk analysis.

Corrosion, stress-corrosion cracking (SCC), erosion-corrosion, and sulfide stress cracking (SSC) are all influenced by the interaction of the environmental factors and the production variables. Other factors not listed can also influence fluid corrosivity.

The purchaser shall determine whether materials shall meet ISO 15156 (all parts) for the sour service environment. ISO 15156 (all parts) addresses metallic material requirements to prevent stress cracking within ISO 15156-specified environmental conditions, but does not address all aspects of corrosion resistance.

Consideration shall also be given to the partial pressure of carbon dioxide, which is related generally to corrosion in Table 1.

2.2 MATERIAL SELECTION

2.2.1 API Specification 17D – 5.1.2.1.2.1

Whenever feasible, assembled equipment that contains and controls well pressure, such as valves, chokes, wellhead housings and connectors, shall be specified by the purchaser, and designed and manufactured to one of the following standard rated working pressures: 34,5 MPa (5 000 psi), 69 MPa (10 000 psi) or 103,5 MPa (15 000 psi).

2.2.2 API Specification 17D – 5.1.2.3.2

Material selection is the ultimate responsibility of the user as he has the knowledge of the production environment as well as control over the injected treatment chemicals. The user may specify the service conditions and injection chemicals, asking the supplier to recommend materials for his review and approval.

2.3 DATA SHEETS

2.3.1

API Specification 17D - Annex M.5.1

M.5 provides suggested data sheets that can be used for enquiry and purchase of subsea wellhead and tree equipment.

NOTE Interactive electronic forms of the data sheets can be accessed by clicking where indicated on the line immediately below the subclause heading.

The data sheets are designed to perform three functions:

- a) assist the purchaser in deciding what he wants;
- b) assist the purchaser in communicating his particular needs and requirements, as well as information on the well environment, to the manufacturer for his use in designing and producing equipment;
- c) facilitate the communication regarding purchaser requirements, relative to the supplier's options and/or capabilities such that a common understanding is agreed.

A copy of the data sheets should be completed as accurately as possible. The typical configurations should be referred to, as required, to select the required equipment. The decision tree in Figure M.1, together with its instructions, provides the recommended practice as to which PSL each piece of equipment should be manufactured. A copy of the data sheet should then be attached to the purchase order or request for proposal.

Data sheets from ISO 10423, Annex A, may also be useful in selecting specific wellhead equipment components.

API[®] Monogram[®] Equipment

Purchase API Spec 17D online at www.api.org/publications

API Specification 17D: 2nd Edition, May 2011 Specification for Design and Operation of Subsea Production Systems—Subsea Wellhead and Tree Equipment

2.3.2 API Specification 17D – Annex M.5.1

a) Location and water depth

	Description	Comm en ts	
Number of wells	5		
Well identifier			
Well location(s)	Block: Location X: Location Y:	Latitud e: Longitude:	
Water depth	metres (feet)		

b) Reservoir flow rates and pressures

Comments		
FWHP (at wellhead)	MPa (psi)	
FWHT	"C("F)	
SIWP	MPa (psi)	

Metocean data

	Description	Comments
Current profile vs. Water depth	Water depth velocity m (1) m/s (1/s)	
Current direction	☐ Aligned to waves	
Significant and Maximum wave height	N _s : m (ft) N _{mac} : m (f)	
Wave period	7 _p : sec	
Wanue speckrum	☐Jonswap ☐Pierson — Moskowitz ☐Other specify:	

API[®] Monogram[®] Equipment

Purchase API Spec 17D online at www.api.org/publications

API Specification 17D: 2nd Edition, May 2011 Specification for Design and Operation of Subsea Production Systems—Subsea Wellhead and Tree Equipment

d) Drilling plan

Type of drilling vessel	Plan for well completion	
☐Jackup rig	☐ Drill and complete	
☐Moored semi	☐ Drill, abandon and complete	
□DP semi	☐Complete previously drilled well	
☐Moored drillship	Other specify:	
□DP drillship	100 100	
☐ Lightweight intervention		
Other specify:		

e) Wellhead interface

	Baseline	Options
Wellhead type	mudline suspension	Other specify:
Wellhead size	□18-3F+*	☐16-3/4* ☐ Other specify:
Wellhead working pressure rating	□69,05 MPa (10 000 psi) □103,5 MPa (15 000 psi)	Other specify:
Shallow water flow system?	□No	Yes. Specify surface casing size(s):
Rigid lock/Preloaded high-pressure housing	□No	□Yes
Guidance	□Guideline (GL)	Guidelineless (GLL) Funnel up (GLL) Funnel down (GLL) Guidelineless orientation, specify:
Surface pipe installation	□ Drilled , requires TGB □ Jetted, requires jetting tool □ Drill-ahead tool	☐Other specify: ☐Size (OD/wall), specify:
On lemplate?	□No	☐Yes, specify:
Casing program	□30"x20"x13-3/8"x9-5/8" H ₂ S: Yes □ N o □	Other specify:
Number of submudline and/or liner hangers to be suspended in wellhead	Specify: H₂S: Yes ☐ No ☐	
Max. number of hangers that can be suspended in wellhead	Specify:	

API[®] Monogram[®] Equipment

Purchase API Spec 17D online at www.api.org/publications

API Specification 17D: 2nd Edition, May 2011 Specification for Design and Operation of Subsea Production Systems—Subsea Wellhead and Tree Equipment

STOWER SERVICE AND THE		Baseline	Ups	ions
Anticipated tubing hanger	completion	☐ In the wellhead ☐Separate tubing head	1	Other specify:
Casing hanger lockdown	bushing?	No 	OY.	es ther specify:
Wellhead top profile		□Clamp hub □Mandrel	□G	Other specify: askel Nope cify:
Production casing hanger	size	□9-5/8" □10-3++"		Other specify:
Casing hanger thread pro	file	Bulless		ther specify:
Production casing drift dia	ımeter	Specify:		
Production casing hanger surface on ID (for enhanced tubing band	Managananan	□No	Υ	es
(for enhanced tubing hanger seal) Distance from mudline to top of surface pipe or high pressure wellhead housing		□3 - +,6 m (10 - 15 f)		Other specify:
Marine drilling riser loads extreme, accidental, and load combinations (see ISO 13628-1, 5.6.2.2	fatigue) and			
Seabed hydrates anticipated			1000	200
Seabed hydrates anticipa	ted	□No	□Y	es
Low pressure outlets	ted	∐No □No	_Y	37
Low pressure outlets Downhole interface	8	□No Description OD: Weight: lbs/ft	4 200	37
Low pressure outlets	8	□No Description OD:	Y	37
Low pressure outlets Downhole interface		□No Description OD: Weight: lbs/ft Material grade: Type of connection: Insulated: □no □ hes	Y	37
Low pressure outlets Downhole interface Tubing size Service life requirement		□No Description OD: Weight: lbs/ft Material grade: Type of connection: Insulated: □no □ hes	Y	37
Low pressure outlets Downhole interface Tubing size Service life requirement	s	□No Description OD: Weight: lbs/ft Material grade: Type of connection: Insulated: □no □ hes	daled:	ès

API[®] Monogram[®] Equipment

Purchase API Spec 17D online at www.api.org/publications

API Specification 17D: 2nd Edition, May 2011 Specification for Design and Operation of Subsea Production Systems—Subsea Wellhead and Tree Equipment

h) Anticipated well teback

Type of tieback	Comments
Fixed platform feback	
Floating (or compliant) platform feback	
Subsea completion	

M.5.3 Subsea tree data sheet

The purpose of the following data sheets is to capture information about a subsea tree for the application.

a) Location and water depth

	Description	Comments	
Number of wells			
Well identifer	irj. Prod. Interchangeable		
Well location(s)	Block: Location X: Location Y:	Laftude: Longitude:	
Water depth	metres (feet)		
Seabed temperature	"C("F)		

b) Reservoir general information

		Comments
Flow rates/zone		X4.
- Gas	(m³/d) SCFD	SCFD
- Oil or condensate	(m³/d) BPD	(m³/d) BPD
- Waler	(m³/d) BPD	(m²/d) BPD
FWHP (at wellhead)	MPa (psi)	10 60
FWHT	"C("F)	
SIMP	MPa (psi)	10
Commingling		
Completion type	(open hole, cased well, gravel pack, etc.)	ê
Producing life	years	
Gas lift point	not required required, specify location:	19

API[®] Monogram[®] Equipment

Purchase API Spec 17D online at www.api.org/publications

API Specification 17D: 2nd Edition, May 2011 Specification for Design and Operation of Subsea Production Systems—Subsea Wellhead and Tree Equipment

à Reservoir fluid properties

	Description	Comm en ts
Reservoir pressure	MPa (psi)	44
Reservoirtemperature	°C(°F)	
Reservoir properties	O per specify:	
Fluid Ape	□0il □Gas	
Gas-oil rafo	m²/m² (scf/bbl)	ľ
API gravity	"API	
Gas gravity		12
Condensate yield	m²/m² (bbl/scf)	è
H ₂ S	MPa pp (psi pp) mol %	
CO ₂	MPa pp (psi pp) mol %	
Cloud point temperature	°C(°F)	
Paraffin	mass % Deposition rate:	
Asphaltenes	mass % Precip. pressure: MPa (ps)	
Formation water salinity or dissolved NaCl concentration	mass % or ppm	
Formation water pH		
Sand production	Sand rate: g/m² (lb/bbl) of produced fluid Particle size: micron Partide ype: (smooth, angular)	

API[®] Monogram[®] Equipment

Purchase API Spec 17D online at www.api.org/publications

API Specification 17D: 2nd Edition, May 2011 Specification for Design and Operation of Subsea Production Systems—Subsea Wellhead and Tree Equipment

d) Metocean data

	Description	Comm r n tv
Current profile vs.water depth	Water depth velocity m (f) m/s (ft/s)	
Current direction	☐ Aligned to wasses	
Significant and maximum wave height	H _a : m (ft) N _{max} : m (ft)	8
Wave period	Tp: 9ec	
Manue spectrum	□Jonswap □Pierson - Moskowitz □Other specify:	

e) Vessel plan

Type of completion vessel	Plan for well completion
☐Jackup rig	☐Drill and complete
☐Crane capacity	☐Specify:
☐Moored semi	☐ Drill, abandon and complete
□DP semi	☐Complete previously drilled well
□Moored drillship	Other specify:
DP drillship	40 100
☐ Lightweight intervention	
Other specify:	

API[®] Monogram[®] Equipment

Purchase API Spec 17D online at www.api.org/publications

API Specification 17D: 2nd Edition, May 2011 Specification for Design and Operation of Subsea Production Systems—Subsea Wellhead and Tree Equipment

Wellhead interface

	Baseline	Options
Wellhead type	mudline suspension subsea	Other specify:
Wellhead size	☐18-34+*	☐ 16-3/+* ☐ Other specify:
Wellhead working pressure rating	□69,05 MPa (10 000 psi) □103,5 MPa (15 000 psi)	Other specify:
Wellhead top profile	Clamp hub	☐ Other specify: ☐Gaske1 Npe specify:
Rigid lock/preloaded high-pressure housing	□No	□Yes
Casing hanger lockdown bushing?	□No Capacity, specify:	☐Yes ☐Other specify:
Guidance	□ Guideline (GL)	Guidelineless (GLL) Funnel up (GLL) Funnel down (GLL) Guidelineless orientation, specify:
On lemplate?	□No	☐Yes, specify:
Tubing hanger completion	☐ In the wellhead ☐Separate tubing head	Other specify:
Production casing hanger size	□9-5/8" □10-3++*	Other specify:
Number of hangers suspended in wellhead	Specify:	
Production casing drift diameter	Specify:	
Production casing hanger has CRA seal surface on ID (for enhanced tubing hanger seal)	□No	□Yes
Distance from mudline to top of surface pipe or high pressure wellhead housing	3m ю +,6 m (10 fl ю 15 fl)	Other specify:
Marine drilling riser loads (i.e. nomal, extreme, accidental, and fatigue) and load combinations (see ISO 13628-1, 5.6.2.2)	(8 ×)	

g) Topsides, platform and field Information

	Description	Comments
Host location	Block:	1
	Location X:	Latitude:
	Location Y:	Longitude:
Water depth	m (ft)	A 1
Offset distance	km (miles)	9-
Separator pressure	MPa (ps)	2
Process capacity	0il: m²/d (BPD) Gas: m²/d (SCFD) Water: m²/d (BPD)	
Slug catchersize, if any	m² (bbl)	
J-Tubes: No. and size	8	
I-Tubes: No. and size	4	
No. of pipeline crossings	.0	1
Surface air temperature	Min.: °C (°F)	*
	Max.: "C ("f)	
Surface water temperature	Min.: °C (°F)	
	Max.: "C ("F)	8
Seabed temperature	°C (°F)	

h) Downhole interface

	Description	
Tubing size	OD: Weight: Ibs/ft Material grade: Type of connection: Insulated:nolyes Drift = Special requirements: Describe insulation if insulated:	
Subsurface safely ualue (SCSSV)	Manufacturer: Model: Size: Working pressure: Control pressure required: Comments on type:	

API[®] Monogram[®] Equipment

Purchase API Spec 17D online at www.api.org/publications

API Specification 17D: 2 nd Edition, May 2011
Specification for Design and Operation of Subsea
Production Systems—Subsea Wellhead and Tree
Equipment

i) Service life requirements

S	ubsea service life		Reusability
Ba se line	Options	Ba se lin e	Options
□20 yrdesign life	Other specify:	□ Do not reuse	Refurbishment & reuse Specify:

) Well intervention requirements

Type of intervention	Anticipated frequency (example: 1 time each 5 years)
Wireline intervention	
Coiled tubing intervention	
Pull tubing intervention	
Drilling riser-BOP, CAWO riser, wellhead foundation load design basis	

i) Select type of subseatree

Type of tree	Water depth	Guidance for installation
Type of tree Verical tee with Libing hanger completed in wellhead Verical tee with Libing hanger completed in tubing head Horizontal Mudline suspension	< 100 m (< 300 f) 100 m to < 300 m (300 f) to < 1,000 f) 1300 m to < 915 m	Guidance for invallation Diveroperated or assist Diverless (ROV) Guideline (GL) Guidelineless (GLL) Funnel up (GLL) Funnel down (GLL) Guidelineless orientation, specify:

f) Tree location

Baseline	Options
☐Single satellite well	Daisy chained wells on common flowline or flowine pair
	Multi well cluster manifold application
	□On template wells
	Off template well, but tree to be compatible with on template application

API[®] Monogram[®] Equipment

Purchase API Spec 17D online at www.api.org/publications

API Specification 17D: 2nd Edition, May 2011 Specification for Design and Operation of Subsea Production Systems—Subsea Wellhead and Tree Equipment

m) Industry specifications

	Baseline	Options
Production valve size	Production bore Specify:	
Annulus value size		Other specify:
Working pressure rating	□34,5 MPa (5 000 psi) □69,05 MPa (10 000 psi) □103,5 MPa (15 000 psi)	Other specify:
PSL level	□ 2	
(see Figure M.1 — PSL decision tree for subsea equipment)	□3 □36	
Material class	Specify:	*
Chlorides	□< 20 000 ppm	☐ 20 000 ppm to 50 000 ppm ☐ 50 000 ppm to 100 000 ppm Other specify:
Temperature class	Specify:	Other requirements: (J-T cooling, Malerial Impacts lemperature, etc)
TFL (see ISO 13628-3)	☐ Not required	☐ Specify requirements:

API[®] Monogram[®] Equipment

Purchase API Spec 17D online at www.api.org/publications

API Specification 17D: 2nd Edition, May 2011 Specification for Design and Operation of Subsea Production Systems—Subsea Wellhead and Tree Equipment

ri) Downhole interface

	Base line	Options
Tubing size, OD	Specify:	S2
Min. vertical access bore size required through tree	Specify:	
Tubing material	Specify:	8
Subsurface safety valve type, model, size, working pressure	Specify:	Description:
Total number of SCSSV control lines	□ 1	☐2 ☐3 ☐+ ☐ Other specify:
Total number of other downhole hydraulic control lines (e.g. for intelligent well completions)	□	1 2 Other: Specify function(s)
Total number of downhole chemical injection lines	□o	1 2 3 Other: Specify function(s):
Total number of downhole electrical lines	o	1 2 3 Other: Specify function(s):
Total number of downhole optical lines	□ 0	1 2 3 Other: Specify function(s):

API[®] Monogram[®] Equipment

Purchase API Spec 17D online at www.api.org/publications

API Specification 17D: 2nd Edition, May 2011 Specification for Design and Operation of Subsea Production Systems—Subsea Wellhead and Tree Equipment

o) Tubing hanger for vertical tree

	Baseline	Options
Working pressure rating	□Same as tee	Other specify:
Wreline plug model, type, size, and pressure rating for production bore	Specify:	(-5)1- 50% 350
Wreline plug model, type, size, and pressure rating for annulus bore (if applicable)	Specify:	☐ Other specify: (check undue, etc)
Bottom production tubing type, size of thread connection	Specify:	
Bottom annulus bore type, size of thread connection (if applicable)	Specify:	☐ Isolation valve Specify: ☐ Other specify: (plug catcher, open, etc.)
Min. dia. of production bore	Specify:	8
Draft requirements	Specify:	9
Min. "low" dia. of annulus bore (if applicable)	□Tubing head Specify: □Tubing hanger Specify:	Other specify:
Bollom connection for SCSSV line(s)	Specify:	8
Bottom connection for downhole chemical line(s), if applicable	Specify:	
Bottom connection for other downhole hydraulic line(s), if applicable	Specify:	
Bottom connection for electrical line(s)	Specify:	
Bottom connection for optic line(s)	Specify:	

API[®] Monogram[®] Equipment

Purchase API Spec 17D online at www.api.org/publications

API Specification 17D: 2nd Edition, May 2011 Specification for Design and Operation of Subsea Production Systems—Subsea Wellhead and Tree Equipment

p) Tubing hanger for horizontal tree

	Baseline	Options
Working pressure rating	☐Same as tee	Other specify:
Wireline plug model, type, size, and pressure rating for production bore	Specify:	And - 300
Bottom production tubing type, size of thread connection	Specify:	
Min. dia. of production bore	Specify:	2
Bottom connection for SCSSV line(s)	Specify:	8
Bottom connection for downhole chemical line(s), if applicable	Specify:	
Bottom connection for other downhole hydraulic line(s), if applicable	Specify:	8
Bottom connection for electrical line(s)	Specify:	6.
Bottom connection for optic line(s)	Specify:	

q) Hydraulic operating pressures for valves and chokes

	Ba se line	Options
Max, control pressure required to operate SCSSV	Specify:	10.1.00.00001
Max, allowable control pressure that can be applied to SCSSV	Specify:	
Max. control pressure required to operate valve or choke	Specify:	
Max, allowable control pressure that can be applied to valve or choke actuator	Specify:	*

i) Valves common to vertical and horizontal trees

Valve	Baseline	Size	Pressure	Operator	Override/
					Position indicator
□ PMV	Fail-dosed				Specify qly.:
□ PUW	Fail-closed				Specify qty.:
□AMA	Fail-dosed	0		-	Specify qly.:
□ AMA	Fail-closed				Specify qly.:
□X0Y	Fail-closed	55	*	- 0	Specify qly.:
□X0V	Fail-open	1	T.	1	Specify qly.:
☐ FIV (or PSDV)	Optional				Specify qly.:
□сіті	Optional				Specify qly.:
□сπx	Optional				Specify qly:
□CID×	Optional Select backup ualue:				Specify qly:
□SV1	Needle uziue			Diveror ROV	No position indicator
□St/x	Optional needle ualue(s)			Dimer or ROV	No position indicator Specify qly:
□HYDx	Optional needle ualue(s)			Diuer or RO∨	No position indicator Specify qly:
□īsī	Meedie uzalue	98		Diver or ROV	No position indicator

s) Valves unique to vertical trees

Valve	Baseline	Size	Pressure	Operator	Override/ Position indicator
□PSV	Marual			Diuer or ROV	Specify qly:
☐ASV	Manual			Diuer or ROV	Specify qly:
⊓тнsт	Optional needle valve fortubing head			Diver or ROV	No position indicator

API[®] Monogram[®] Equipment

Purchase API Spec 17D online at www.api.org/publications

API Specification 17D: 2nd Edition, May 2011 Specification for Design and Operation of Subsea Production Systems—Subsea Wellhead and Tree Equipment

) Valves unique to horizontal trees

Valve	Baseline	Sier	Pressure	Operator	
□AAV	fail-close d	i a		Specify qly:	
Penetration isolation ualue(s)	Needle valve		Diveror ROV	No position indicator	

u) Tree mounted chokes

	Base line	Options
Production (or injection)	□None	Check all options required:
choke	☐Specify Cu:	☐ Hydraulic operated ☐ Bectric operated
	500 - 600	☐R0Voperated (primary or override)
		☐Diver operated (primary or override)
		☐ insert retrieuarble
		□Adjustable, specify steps:
		☐ Fixed onitice
		☐Msual position indicator
		☐Bectronic position indicator (LVDT)
		☐Specify other requirements:
Production orifice valve	□None	☐Fail-open (full bore) ☐Fail-closed (orifice)
(P0V)	Specify Cu:	☐R0Voperated (primary or override)
		☐Diver operated (primary or override)
		☐Fixed orifice size, specify:
		□Value size, specify:
	50.14	□Valve pressure_rating, specify:
Gas lift choke	□None	Check all options required:
	Specify Cu:	☐ Hydraulic operated ☐ Bectric operated
	Cooperation on	☐R0Voperated (primary or override)
		☐Diver operated (primary or override)
		☐ Insert retrieuable
		□ Adjustable, specify steps:
		Fixed orifice
		☐Msual position indicator
		☐ Bectronic position indicator (LVDT)
		Specify other requirements:

API[®] Monogram[®] Equipment

Purchase API Spec 17D online at www.api.org/publications

API Specification 17D: 2nd Edition, May 2011 Specification for Design and Operation of Subsea Production Systems—Subsea Wellhead and Tree Equipment

i) Flowline connection methods and external loading

	Ba se line	Options
Diver assist tree	(17DSS) Swivel flange	Clamp hub
	- 11 h	Specify other requirements:
Diverless tree	∐Verical hub	☐Vertical flange (fixed)
	☐Horizontal hub (fixed)	☐Horizontal flange (fixed)
	120 AV	☐ Horizontal hub (tree piping moves to accommodate connection)
		Stab and hinge over (jumper resident active cornector)
		☐Flexible pipe (see ISO 13628-11)
		Specify other requirements:
Flowline load design basis		7A
Snag load protection	☐Not required	Provided at tree flowline connection
pour out and the conductive condu		Provided at flowline sled or manifold cornection
		Provided in flowline
		Other specify:
Define snag load design basis		***
Dropped object protection	☐Not required	Provided at tree flowline connection
10 80 W	- 12 AND	Provided at flowline sled or manifold cornection
		Provided in flowline
		Other specify:
Dropped object protection load design basis		<u> </u>
Remediation of hydrates in connector	Specify:	

API[®] Monogram[®] Equipment

Purchase API Spec 17D online at www.api.org/publications

API Specification 17D: 2nd Edition, May 2011 Specification for Design and Operation of Subsea Production Systems—Subsea Wellhead and Tree Equipment

y) Sensors

	Baseline	Options
Downhole pressure and lemperature (DHPT)	☐Not required	Required, specify vendor:
Production bore in tree	☐ Not required	Pressure
		□Temperature
		Other specify: (upstream/downstream of choke, etc.)
Annulus bore in tree	☐ Not required	Pressure
	1900 190	☐ Temperature
		Other specify: (upstream/downstream of choke, etc.)
Production (or injection)	Not applicable	Position sensing by LVDT
choke position		Other specify:
Gas lift choke position	☐ Not applicable	Position sensing by LVDT
- 80		Other specify:
Erosion detector	☐ Not required	Intrusive wear-rate sand detector
	(200) 160	☐Acoustic sand detector
	e/	☐Other specify:
Sand detection	☐Not required	Intrusive wear-rate sand detector
2-000 12-400 AD - 000		☐Acoustic sand detector
		☐ Other specify:
Pig delector	☐ Not required	☐Magnetic, non-intrusive
		☐Other specify:
Flow meler	☐Not required	☐Transmit data from flow meter
		Other specify:
Downhole sensors for intelligent well completion	☐Not required	Specify:

API[®] Monogram[®] Equipment

Purchase API Spec 17D online at www.api.org/publications

API Specification 17D: 2nd Edition, May 2011 Specification for Design and Operation of Subsea Production Systems—Subsea Wellhead and Tree Equipment

z) Flow assurance

	Ba se line	Options
Downhole chemical injection	☐ Not required	Corrosion inhibitor: specify chemical, flowrate and injection point:
		Scale inhibitor: specify chemical, flowrate and injection point:
		Paraffin inhibitor: specify chemical, flowrate and injection point:
		☐ Hydrate inhibitor: specify chemical, flowrate and injection point:
	80	Other, specify:type, chemical, flowrate and injection point:
Tree chemical injection	☐ Not required	Corrosion inhibitor: specify chemical, flowrate and injection point:
		Scale inhibitor: specify chemical, flowrate and injection point:
		☐Paraffin inhibitor: specify chemical, flowrate and injection point:
		Hydrate inhibitor: specify chemical, flowrate and injection point:
		Other, specify:type, chemical, flowrate and injection point:
Gas lift	☐ Not required	Required, specify:
		gas lift pressure: MPa (psi)
		flow rate: m³Nd (sofd)
		gas lift choke: ☐yes ☐no
Pigging	☐ Not required	Round trip pigging through flowline sleds or manifold, not through tree or well jumpers
		☐Round trip pigging to tree
		Subsea pig- launching from flowline sled or manifold
		Subsea pig-launching from tree
		Other specify:
Insulation	☐ Not required	Check all that apply:
		☐Tree flowtoops
		All pressure-containing bodies on tree
		☐Well jumpers from tree to flowline sled or manifold
		Manifold
		Flowline jumpers from manifold to flowline sled
		Other specify:
insulation	☐ Not applicable	Cool down from °C (°F)
cool down	ALEST ASSOCIATIVA VIA ERCETA	ю "C("F)
AS CONTRACTOR	*5	shall take at least hours

API[®] Monogram[®] Equipment

Purchase API Spec 17D online at www.api.org/publications

API Specification 17D: 2nd Edition, May 2011 Specification for Design and Operation of Subsea Production Systems—Subsea Wellhead and Tree Equipment

	Baseline	Options
Flowline heating	☐ Not required	☐ Hot oil circulation
		☐Bectrical heating
		Other specify:

2.4 OPERATING LOADS

Requirement:

API Specification 17D – Annex 5.1.1.5

The purchaser should confirm that anticipated operating loads are within the operating limits of the equipment being used for the specific application.

3.0 Design Requirements

3.1 MISCELLANEOUS EQUIPMENT

API Specification 17D - 5.1.2.1.8

The design of other equipment, such as running, retrieval and test tools, shall comply with the purchaser's/manufacturer's specifications.

3.2 NON-COVERED EQUIPMENT

API Specification 17D – 5.4.1

For those components not covered in ISO 10423, equipment-specific quality-control requirements shall comply with the manufacturer's written specifications. Purchaser and manufacturer should agree on any additional requirements.

3.3 ACTUATORS

API Specification 17D – 7.10.2.2.4

Position indicators shall be incorporated on all actuators unless otherwise agreed with purchaser. They shall clearly show valve position (open/close and full travel) for observation by diver/ROV. Where the actuator incorporates ROV override, consideration should be given to visibility of the position indicator from the working ROV.

3.4 SUBSEA TREE EQUIPMENT

API Specification 17D – 7.16.2

The purchaser shall specify the operating criteria necessary for the tree installation. The manufacturer shall document the operating limits for which the tree running/retrieval tool is designed.

3.5 CONTROL INTERFACE

API Specification 17D - 7.16.4.1

The tree running tool interfaces with the tree upper connection. This interface shall be designed for emergency release at a running string departure angle as specified by the manufacturer or purchaser. This release shall not cause any damage to the subsea tree such that prevents meeting any other performance requirement.

3.6 CONNECTORS

API Specification 17D – 7.16.4.1

For use with dynamically positioned rigs, it is particularly important that the connector have a high-angle release capability and that the connector can be quickly unlocked. In some systems, the EDP connector design can meet these requirements. The manufacturer and/or purchaser shall specify the angle and unlocking time.

3.7 CHOKES

API Specification 17D - 7.21.2.14

The choke flow capacity is determined in accordance with requirements of ISA 75.01.01 and ISA 75.02 for anticipated or actual production flow rate and fluid conditions (pressures and temperature). The information shown in Annex M for purchasing guidelines shall be supplied to the choke manufacturer for the sizing of the choke.

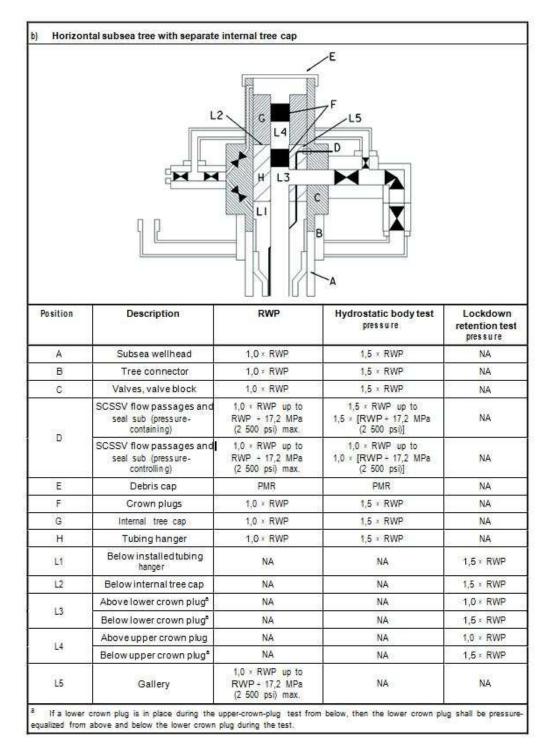
4.0 Testing Requirements

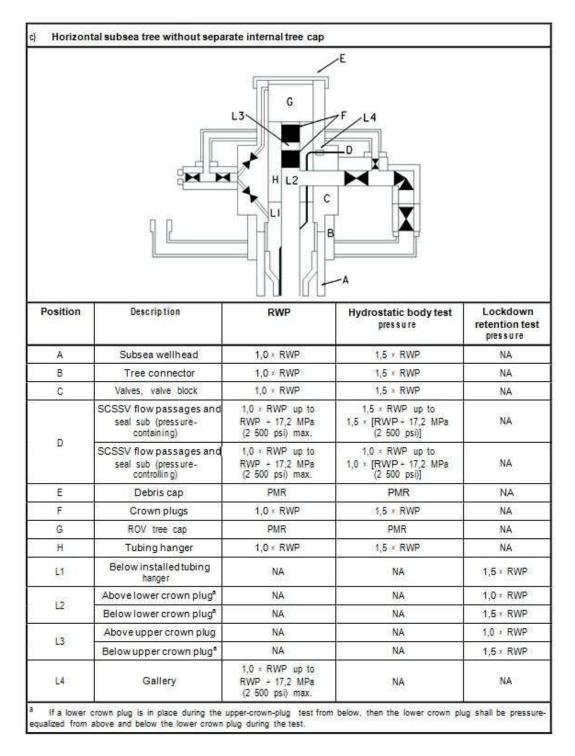
4.1 SUBSEA TREE EQUIPMENT

API Specification 17D - 6.3.2

Position Description RWP Hydrostatic body test Lockdown pressure retention test pres s u re Vertical subsea tree 1,5 × RWP 1,0 × RWP A NA Subsea wellhead Tubing head connector, В 1,0 × RWP 1,5 × RWP NA Tubing head and tree connector C Valves, valve block 1,0 : RWP 1,5 × RWP NA SCSSV flow passages and 1,0 × RWP up to 1,5 x RWP up to RWP - 17,2 MPa 1,5 x [RWP + 17,2 MPa NA seal sub (pressure-containing) (2 500 psi)] (2 500 psi) max. D 1,0 = RWP up to 1,0 = [(RWP - 17,2 MPa 1,0 × RWP up to SCSSV flow passages and RWP - 17,2 MPa NA seal sub (pressure-controlling) (2 500 psi) max. (2 500 psi)] Tree cap (passages and E 1,0 x RWP NA 1,5 x RWP lock mechanism) F Tubing hanger 1.0 × RWP 1.5 × RWP NA Below installed tubing LI NA NA 1,1 x RWP hanger Above tubing plug NA 1,0 = RWP NA L2 (not shown) Below tubing plug NA NA 1,1 × RWP 1,0 x RWP up to Gallery RWP + 17,2 MPa NA NA (2 500 psi) max.

Table 4 — Pressure test pictorial representations





4.2 SUBSEA TREE ASSEMBLIES

API Specification 17D - 6.3.5

Any disassembly, removal or replacement of parts or equipment after testing shall be as agreed with the purchaser.

4.3 SUBSEA TREE PIPING

API Specification 17D – 7.17.2.5

The manufacturer shall document the ability to pig tree piping where such piping is intended to be piggable. Demonstration of the piggability of the intended piping shall be agreed to by the purchaser and manufacturer.

4.4 SUBSEA TREE CONTROL INTERFACES

4.4.1 API Specification 17D – Annex L

If agreed between the purchaser and manufacturer, the hyperbaric test medium should be maintained at 4 °C \pm 5 °C (40 °F \pm 10 °F) throughout the test.

4.4.2 API Specification 17D – Annex L

If agreed between the manufacturer and purchaser, the hyperbaric functional test cycles may be in addition to life-cycle endurance testing and temperature cycling, such as that specified in ISO 10423, Annex F, for PR2. For example, a valve and actuator assembly may be subjected to a total of 400 functional cycles, of which 200 are hyperbaric as described in this annex, and 200 are as described in ISO 10423, Annex F, PR2, including 20 cycles at maximum rated temperature and at minimum rated temperature.

.

5.0 Storage and Preservation Requirements

5.1 SUBSEA TREE EQUIPMENT

5.1.1 API Specification 17D – 5.1.2.2.4

If subsea equipment will be stored or tested on the surface at temperatures outside of its temperature rating, then the manufacturer should be contacted to determine if special storage or surface-testing procedures are recommended.

5.1.2 API Specification 17D – 5.6.10

Storage and preservation requirements for equipment after delivery to the user is beyond the scope of this part of ISO 13628. The manufacturer shall provide recommendations for storage to the user upon request.

5.2 SUBSEA TREE CONTROL INTERFACES

API Specification 17D – 7.20.3.2

After assembly, all tubing runs and hydraulically actuated equipment shall be flushed to meet the cleanliness requirements of SAE/AS 4059. The class of cleanliness shall be as agreed between the manufacturer and purchaser.

6.0 Shipping Requirements

6.1 SUBSEA TREE EQUIPMENT

API Specification 17D – 5.6.1

Prior to shipment, the total shipment including hydraulic lines shall be flushed and filled in accordance with the manufacturer's written specification. Exposed hydraulic end fittings shall be capped or covered. All pressure shall be bled from equipment, unless otherwise agreed between the manufacturer and purchaser.

7.0 Documentation Requirements

7.1 SUBSEA TREE EQUIPMENT, SUBSEA WELLHEAD EQUIPMENT, MUDLINE SUSPENSION SYSTEM EQUIPMENT, DRILL THROUGH MUDLINE SUSPENSION SYSTEM EQUIPMENT, TUBING HANGER SYSTEM EQUIPMENT, MISCELLANEOUS EQUIPMENT

7.1.1 API Specification 17D – 5.1.5

All design requirements shall be recorded in a manufacturer's specification, which shall reflect the requirements of this part of ISO 13628, the purchaser's specification or manufacturer's own requirements. The manufacturer's specification may consist of text, drawings, computer files, etc.

7.1.2 API Specification 17D – 5.1.5

The manufacturer shall define additional validation tests that are applicable and demonstrate that this validation testing can be correlated with the intended service life and/or operating conditions in accordance with the purchaser requirements