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API Monogram Effective Date: December 2024

Addendum 2

Section 3 : The definitions shall be added and all subsequent definitions updated

3.1.50

Rated working pressure small-bore lines

RWP-SB

Maximum internal pressure (up to 2500psi [17.2MPa] over the tree system RWP) that the Small-Bore Lines are designed to contain and/or control.

3.1.70

Underwater Safety Valve (USV)

Automatic valve assembly installed at a subsea well location that closes on loss of power supply.

NOTE where used in this specification, the term USV is understood to include a valve and actuator.

3.1.71

USV actuator

Device that causes the USV to open when power supply is supplied and to close automatically when power is lost or released.

3.1.72

USV valve

Portion of the USV that contains the well stream and shuts off flow when closed.

Section 5.1.2.1: Update paragraph 1 to the following:

Where small-bore lines [e.g. surface-controlled subsurface safety valve (SCSSV) control lines, chemical injection lines] pass through a cavity such as the tree/tubing hanger cavity, the equipment bounding that cavity shall be hydrostatically pressure tested at or above the maximum rated working pressure (RWP-SB) of any of those small-bore lines, unless a means is provided to monitor and relieve cavity pressure (see Table 6, 7.9.1 and 9.1.7 for additional information).

Table 5

Change "Valve operated with actuators" to " valve operated by actuators"

Section 5.4.5.1. Split paragraph 4 into the following 2 paragraphs:

Momentary pressure drops during the hold period due to sensitivity/noise in electronic data acquisition systems are permitted so long as the final pressure recorded is above the specified minimum test pressure

and measurement devices have remained isolated from the pressure source throughout the entire hold period.

NOTE: If a pressure-monitoring gauge and/or chart recorder is used for documentation purposes, the chart record may have a pressure settling rate not exceeding 3 % of the test pressure, or 300 psi (2 MPa) per hour, whichever is less.

Section 5.4.5.2: The following shall be added:

Valves with nonstandard bores shall follow API 6A drift requirements.

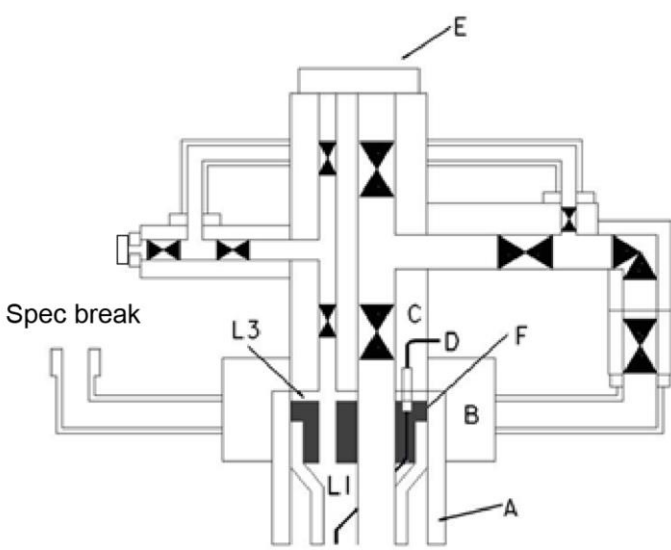
Section 6.2.11: The section shall be updated to the following:

“Threaded connections for chemical injection penetrations shall not be used when inboard of the two closure devices”

Table 6a, b and c: The tables shall be updated as indicated in the red box

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a) Vertical Subsea Tree



Position	Description	Working Test Pressure	Hydrostatic Body Test Pressure	Lockdown Retention Test Pressure
A	Subsea wellhead	1.0 × RWP	1.5 × RWP	NA
B	Tubing head connector, tubing head, and tree connector	1.0 × RWP	1.5 × RWP	NA
C	Valves, valve block	1.0 × RWP	1.5 × RWP	NA
D	Downhole flow passages and seal subs (SCSSV, other hydraulic, injection) (pressure-containing)	1.0 × RWP-SB	1.5 × RWP-SB	NA
	Downhole flow passages and seal subs (SCSSV, other hydraulic, injection) (pressure-controlling)	1.0 × RWP-SB	1.0 × RWP-SB	NA
E	Tree cap (flow passages below tree cap and lock mechanism)	1.0 × RWP	1.5 × RWP	NA
F	Tubing hanger	1.0 × RWP	1.5 × RWP	NA
L1	Below installed tubing hanger	NA	NA	1.1 × RWP
L2 (not shown)	Above tubing hanger plug	NA	NA	1.0 × RWP
	Below tubing hanger plug	NA	NA	1.1 × RWP

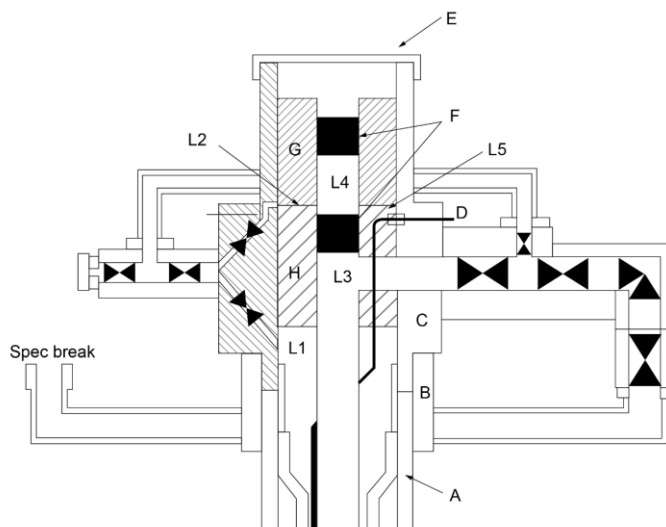
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L3	Gallery	1.0 × RWP-SB	NA	NA
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b) Horizontal Subsea Tree with Separate Internal Tree Cap



Position	Description	Working Test Pressure	Hydrostatic Body Test Pressure	Lockdown Retention Test Pressure
A	Subsea wellhead	1.0 × RWP	1.5 × RWP	NA
B	Tree connector	1.0 × RWP	1.5 × RWP	NA
C	Valves, valve block	1.0 × RWP	1.5 × RWP	NA
D	SCSSV flow passages and seal subs (SCSSV, other hydraulic, injection) (pressure-containing)	1.0 × RWP-SB	1.5 × RWP-SB	NA
	SCSSV flow passages and seal subs (SCSSV, other hydraulic, injection) (pressure-controlling)	1.0 × RWP-SB	1.0 × RWP-SB	NA
E	Debris cap	PMR	PMR	NA
F	Crown plugs	1.0 × RWP	1.5 × RWP	NA
G	Internal tree cap	1.0 × RWP	1.5 × RWP	NA
H	Tubing hanger	1.0 × RWP	1.5 × RWP	NA
L1	Below installed tubing hanger	NA	NA	1.5 × RWP
L2	Below internal tree cap	NA	NA	1.5 × RWP
L3	Above lower crown plug	NA	NA	1.0 × RWP

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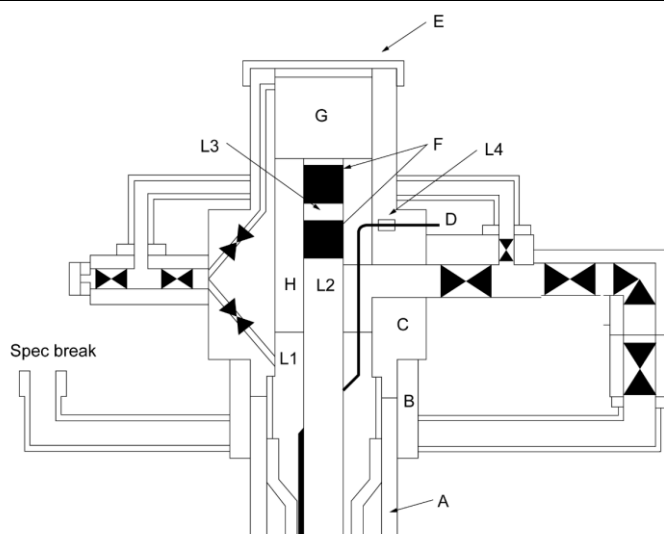
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	Below lower crown plug	NA	NA	1.5 × RWP
L4	Above upper crown plug	NA	NA	1.0 × RWP
	Below upper crown plug ^a	NA	NA	1.5 × RWP
L5	Gallery	1.0 × RWP-SB	NA	NA

^a If a lower crown plug is in place during the upper-crown-plug test from below, then the lower crown plug shall be pressure-equalized from above and below the lower crown plug during the test.

c) Horizontal Subsea Tree without Separate Internal Tree Cap



Position	Description	Working Test Pressure	Hydrostatic Body Test Pressure	Lockdown Retention Test Pressure
A	Subsea wellhead	1.0 × RWP	1.5 × RWP	NA
B	Tree connector	1.0 × RWP	1.5 × RWP	NA
C	Valves, valve block	1.0 × RWP	1.5 × RWP	NA
D	SCSSV flow passages and seal subs (SCSSV, other hydraulic, injection) (pressure-containing)	1.0 × RWP-SB	1.5 × RWP-SB	NA
	SCSSV flow passages and seal subs (SCSSV, other hydraulic, injection) (pressure-controlling)	1.0 × RWP-SB	1.0 × RWP-SB	NA
E	Debris cap	PMR	PMR	NA
F	Crown plugs	1.0 × RWP	1.5 × RWP	NA
G	ROV tree cap	PMR	PMR	NA
H	Tubing hanger	1.0 × RWP	1.5 × RWP	NA

L1	Below installed tubing hanger	NA	NA	1.5 × RWP
L2	Above lower crown plug	NA	NA	1.0 × RWP
	Below lower crown plug	NA	NA	1.5 × RWP
L3	Above upper crown plug	NA	NA	1.0 × RWP
	Below upper crown plug ^a	NA	NA	1.5 × RWP
L4	Gallery	1.0 × RWP-SB	NA	NA

^a If a lower crown plug is in place during the upper-crown-plug test from below, then the lower crown plug shall be pressure-equalized from above and below the lower crown plug during the test.

Section 7.1.3: Add the following note

NOTE: Manufacturer name and date of manufacture does not need to be included if already included elsewhere on the assembly.

Section 7.9.1: Paragraph 3 updated to the following:

Stab subs and seal subs in the production and annulus bore should conform to standard maximum pressure ratings of 5000 psi (34.5 Mpa), 10,000 psi (69 Mpa), or 15,000 psi (103.5 Mpa) as covered by this specification. The effects of pressure acting externally on stabs and seal subs shall be addressed up to the tree pressure rating, pressure rating of any seal sub in the annulus envelope outside the seal stab, or the hyperbaric pressure rating, whichever is greatest. Stab subs or seal subs used to conduct SCSSV control fluid, other hydraulic fluids, or injected chemicals shall be rated to a working pressure (RWP-SB) equal to or greater than the SCSSV control pressure or injection pressure, respectively, whichever is the higher, and be limited to 2500 psi (17.2 Mpa) plus the RWP of the tree.

Section 7.10.6.1.2: Paragraph 2 updated to the following:

The USV shall be of a fail-close design. The USV shall be designed to operate, without damage to the valve or actuator, when the valve is actuated open or closed, pressurized or depressurized, under any internal valve body pressure within its pressure rating, and under external pressure up to the maximum depth rating.

Section 7.10.6.1.3: Paragraph 1 updated to the following:

USVs shall satisfy the performance requirements specified in Section 5 and shall be validated as specified by API 6AV1 for the sandy service class designated by the manufacturer.

Section 7.10.6.1.3: Paragraph 3 updated to the following

An independent test agency, as defined by API 6AV1, shall conduct the API 6AV1 portion of USV validation and prepare the test report. The manufacturer shall submit a USV of the same basic design and materials of construction for the API 6AV1 validation tests. An independent test agency is not required for other USV validation per Section 5.

Section 7.10.6.3: Update Title to the following

USV Factory Acceptance Testing

Section 7.16.6.3: Update section to the following:

All assembled USVs with USV actuators shall pass all applicable tests per API 17D as required in 7.10.4. All test data records shall be in accordance with 7.10.6.5.

Add the following Sections:

7.10.6.5 USV Records

Record requirements for USVs shall be in accordance with 5.4.1 with the following additional requirements

7.10.6.5.1 Shipping Report

The test agency and test report number for Class II or Class III safety valves shall be identified in the shipping report, as shown in the example of Figure 10. Other formats are acceptable, but they shall include the same information as a minimum.

USV Assembly Shipping Report	
USV Manufacturer _____	
Valve part no. or model _____	Serial no. _____
Size _____	Rated working pressure _____ PSL _____ Material class _____
Temperature class _____	or Temperature rating: Max. _____ Min. _____
Service class _____	Test agency _____ Test report no. _____
Accepted by _____	Date of manufacture (month and year) _____
Actuator data: (circle type): Hydraulic Electric	
Manufacturer _____	Date of manufacture (month and year) _____
Part/model no. _____	Serial no. _____ Size _____
Max. supply pressure rating _____	Temperature rating _____
Accepted by _____	Date of manufacture (month and year) _____
'USV' valve and actuator assembly	
Assembler/manufacturer _____	
Assembly part no. or model _____	Serial no. _____
Accepted by _____	Date of manufacture (month and year) _____

Figure 10--- Example of USV Shipping Report

7.10.6.5.2 Test Data Sheet

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All test data shall be recorded on a test data sheet. An example is shown in Figure 11. Other formats to included applicable tests are acceptable, but they shall include the same information as a minimum.

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USV Assembly Factory Acceptance Test Data Sheet	
USV Manufacturer _____	
Valve part no. or model _____	Serial no. _____
Size _____	Rated working pressure _____ Temperature class/rating _____
PSL _____	Service class _____ Test agency _____ Test report no. _____
Actuator data: (circle type): Hydraulic Electric / Manufacturer _____	
Part/model no. _____	Serial no. _____ Size _____
Max. supply pressure _____	Temperature rating _____ PSL _____
Actuator seal test: Performed by _____ Date _____	
At 20 % of supply pressure rating:	
Start time _____	Pressure at start _____ End time _____ Pressure at end _____
At 100 % of supply pressure rating:	
Start time _____	Pressure at start _____ End time _____ Pressure at end _____
Actuator operational test: Performed by _____ Date _____	
Number of cycles completed _____	Comment (opt) _____
Valve shell test: Performed by _____ Date _____	
Primary hold period:	
Start time _____	Pressure at start _____ End time _____ Pressure at end _____
Secondary hold period:	
Start time _____	Pressure at start _____ End time _____ Pressure at end _____
Valve seat test: Performed by _____ Date _____	
Primary hold period (Side A):	
Start time _____	Pressure at start _____ End time _____ Pressure at end _____
Secondary hold period (Side A):	
Start time _____	Pressure at start _____ End time _____ Pressure at end _____
Tertiary hold period (Side A):	
Start time _____	Pressure at start _____ End time _____ Pressure at end _____
Primary hold period (Side B):	
Start time _____	Pressure at start _____ End time _____ Pressure at end _____
Secondary hold period (Side B):	
Start time _____	Pressure at start _____ End time _____ Pressure at end _____
Tertiary hold period (Side B):	
Start time _____	Pressure at start _____ End time _____ Pressure at end _____
Certified by _____	Title _____
Company _____	Date _____

Figure 11--- Example of a USV Factory Acceptance Test Data Sheet

The following shall be furnished to the purchaser for each valve:

- Completed functional test datasheet as specified in FIGURE 11;
- Shipping report in accordance with Figure 10;
- USV Operating manual shall be furnished to the purchaser;
- Assembly traceability records.

7.10.6.5.4 Minimum Contents of Manufacturer's USV Operating Manual

The design information for USVs shall include the following:

- Type, model and size for which the manual is applicable;
- Performance requirements for which these types, model and sizes are suitable;
- Temperature and working pressure ranges for which the unit(s) is designed;
- Drawing and illustrations giving dimensional data of unit(s), as required, for installation or operation;
- Assembly diagram showing individual parts in proper relationship top one another;
- Parts list.

7.10.6.5.5 Failure Reporting

NOTE: Failure reporting is an essential element of the US federal regulatory program covering gas and oil production in the Outer Continental Shelf of the Gulf of Mexico.

After receiving a failure report from the operator, the manufacturer of the USV equipment shall respond within 6 weeks of receipt, describing progress in the failure analysis. The manufacturer shall also notify the operator in writing of the results of the analysis and the corrective action.

If the failure analysis causes the equipment manufacturer to change the design, assembly, or operating procedures of a model of equipment, the manufacturer shall, within 30 days of such changes, report them in writing to all purchasers and known operators of equipment having potential problems.

Section 7.16.2.6: Update bullet 3 to the following

- Testing—All testing for inboard piping shall conform to the requirements in accordance with 5.4. All testing for outboard piping shall be in accordance with the specified piping code, or 5.4, whichever is appropriate.

Section 7.16.2.6: Update Bullet 4 to the following

- Materials—Materials for inboard piping shall conform to 5.2. Material for outboard piping and pipe fittings shall conform to the requirements of the specified piping code or 5.2, whichever is appropriate. For example, wall thickness calculated using ASME B31.3 requires the use of ASME B31.3 allowable material stresses.

Section 7.17.2.2: Update to the following

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Flowline connectors shall have an RWP equal to the RWP of the tree. The design of the flowline connector shall be in accordance with API 17R and the stress allowables per 5.1 or the selected outboard piping code with respect to movement and alignment conditions. Integral hydraulics shall be in accordance with API 17R and 5.4.7.

Section 7.19.2.6: Update paragraph 2 to the following

For a line that penetrates the wellbore (for example chemical injection):

Annex Q: Add New informative Annex

Subsea Wellhead Annulus Seal Qualification

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Annex Q (informative)

Subsea Wellhead Annulus Seal Qualification

Q.1 General

Q.1.1 Scope

This annex provides additional validation requirements for subsea annulus seals assemblies. The purpose of this annex is to introduce additional performance testing beyond requirements of Table 5.

- Combined annulus pressure and lockdown testing at extreme loads.
- Extended lockdown load cycle testing (with intermittent pressure holds)

Annulus seal assemblies conforming to this annex shall be given a PR3A or PR3AL designation per Table Q1.

NOTE: Previous 'combined annulus pressure and lockdown validation testing' and 'extended lockdown load cycle validation testing' (regardless of test sequence) that have been completed, that meet or exceed the requirements of this annex may be used to conform to the requirements of this annex.

Q.1.2 Performance Requirements

The wellhead annulus seal assembly shall meet the requirements of Section 8.7 and additional performance requirements outlined in Table Q1

The minimum number of load cycles acting on the retention mechanism shall be 100. Reference Section Q.1.6 and figure Q2 for illustration of test cycle.

The annulus seal shall adopt the number of cycles in the PR designation – for example an annulus seal tested to 100 cycles shall be represented with PR3A(100).

The annulus seal and lockdown hanger / bushing shall adopt the number of cycles in the PR designation – for example an annulus seal and lockdown hanger / bushing tested to 100 cycles shall be represented with PR3AL(100).

NOTE1: The annulus seal may have more than one PR rating

Table Q1: PR3A and PR3AL Performance Requirements

Performance Requirements	Testing
PR2F	(Prerequisite) Validation requirements per table 5 group 4 mandrel hanger

PR3A(X)	<p>The validation testing requirements per table 5 group 4 mandrel hangers plus the additional performance validation testing per this annex.</p> <p>PR3A cycle testing installed configuration shall be with annulus seal assembly and casing hanger only.</p> <p>Lockdown hanger/bushing not required.</p>
PR3AL(X)	<p>The validation testing requirements per table 5 group 3 or 4 mandrel hangers plus the additional performance validation testing per this annex.</p> <p>PR2F test shall include lockdown hanger/bushing for group 3 or 4 mandrel hanger testing.</p> <p>PR3AL cycle testing installed configuration shall be with annulus seal assembly, casing hanger and lockdown hanger/bushing.</p>

NOTE2: (X) indicates the number of load cycles achieved during testing or as agreed between manufacturer and purchaser.

NOTE3: PR3A and PR3AL testing specified in this annex does not need to be performed on the same test assembly as the PR2F test fixture. PR3A and PR3AL testing may be performed on new annulus seal and/or lockdown hanger/bushing.

Q.1.3 Validation Test Requirements

Testing shall follow the requirements of section 5.1.7 with exceptions noted below.

- Test medium shall be gas for pressure hold periods.

Q.1.4 Test Acceptance Criteria

Acceptance criteria for gas holds shall be per API 6A, Annex F.

Leakage rates shall be recorded in test documentation for pressure hold periods performed at ambient temperature.

Q.1.5 Validation Test Set-up

Test fixture shall meet the requirements of Section 5.1.7.

Q.1.6 Validation Testing

PR3A and PR3AL testing is split into two sections:

- combined extreme annulus pressure and extreme lockdown load at maximum rated temperature.
- extended load cycle test to establish rated cyclic load capability.

Note: The order of PR3A and PR3AL testing is discretionary.

PR3AL testing shall follow the same sequence as PR3A.

PR3A and PR3AL testing shall be performed on the same test article without disassembly of tested components.

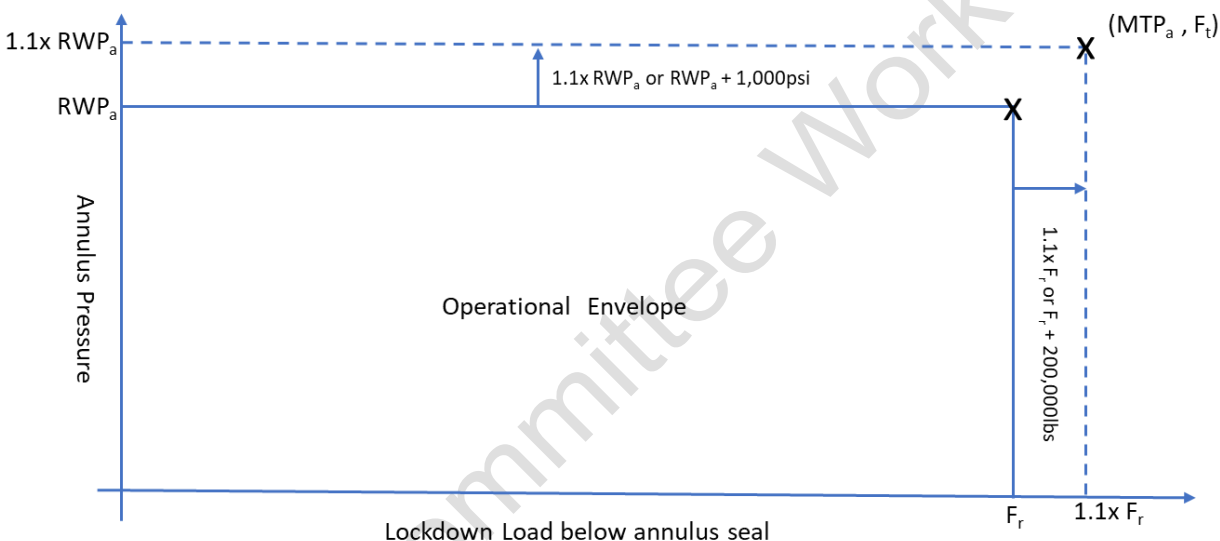


Figure Q1: Sample Annulus seal operational representation

The following are variables that are to be used in this test procedure:

- T_{max} maximum rated temperature
- RWP_b rated working pressure of annulus seal from bore
- RWP_a rated working pressure of annulus seal from annulus
- $MTP_a = \text{the minimum of } 1.1x RWP_a \text{ or, } RWP_a + 1,000\text{psi}$ maximum test pressure of annulus seal from annulus
- F_r rated lockdown load
- F_{rc} value defined by manufacturer. Opposite in direction to F_r . Required to reset annulus seal assembly / casing hanger due to axial movement sustained during lockdown load cycles from below.

- F_t = the minimum of $1.1 \times F_r$ or, $F_r + 200,000\text{lbs}$ maximum tested lockdown load acting from below

Q.1.7 Validation Test Procedure

Q.1.7.1 Test Procedure – Extreme Envelope

- Raise temperature of the fixture to maximum T_{max}
- Apply RTPa followed by F_t to the casing hanger and hold for 15 minutes.
- Release load and release pressure.
- Reduce temperature of the fixture to ambient

Q.1.7.2 Test Procedure – Cyclic Load

- Start with test fixture between 4C and 50C with atmospheric pressure
- Apply load F_r to the casing hanger and maintain for 5 mins. Release load. Apply load F_{rc} to the casing hanger and release load.
- Repeat until 19 cycles are completed.
- At every 20th cycle, apply pressure RWPa, followed by load F_r to the casing hanger and hold for 15 minutes. Acceptance criteria per Section Q.1.4
- Release load and release pressure.
- Apply pressure RWPb, hold for 15 minutes. Acceptance criteria per Section Q.1.4
- Release pressure.
- Repeat sequence of 20 cycles until minimum required number of cycles (100) is achieved or additional cycles as agreed between user and manufacturer.

NOTE1: A failed pressure test, either from bore or annulus of the annulus seal constitutes cyclic testing failure.

NOTE2: The last successful pressure hold may be used as the rated cycle count in the event of test failure beyond 100 cycles