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## **ADDENDUM 2**

*Replace **Annex O** in its entirety with the following pages.*



## Annex O (normative)

### API Regional Annex

#### O.1 Technical Modifications to ISO 10423:2009

API Committee on Standardization of Oilfield Equipment and Material/Subcommittee 6 has balloted and approved the following technical revisions for the National Adoption of ISO 10423.

<u>Clause/Subclause</u>	<u>Modification</u>
2	<p>Replace “For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.” with:</p> <p>“For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies, except that new editions may be used on issue and shall become mandatory 6 months from the date of the revision.”</p>
2	<p>Replace the normative reference “ASTM A703/A703M-08a” with:</p> <p>“ASTM A703/A703M, <i>Standard Specification for Steel Castings, General Requirements, for Pressure-Containing Parts</i>”</p>
2	<p>Add the following normative references:</p> <p>“ASTM A609, <i>Specification for Ultrasonic Examination for Carbon and Low-Alloy Steel Castings</i></p> <p>ASTM E186, <i>Standard Reference Radiographs for Heavy-Walled (2 to 4½ in.) Steel Castings</i></p> <p>ASTM E280, <i>Standard Reference Radiographs for Heavy-Walled (4½ to 12 in.) Steel Castings</i></p> <p>ASTM E446, <i>Standard Reference Radiographs for Steel Castings Up to 2 in. in Thickness</i>”</p>
3.1	<p>Add the following definitions:</p> <p><b>“3.1.145 full overlay equipment</b> equipment where all retained fluid-wetted surfaces are either weld overlaid or weld clad with a corrosion-resistant alloy or an austenitic stainless steel”</p> <p><b>“3.1.146 partial overlay equipment</b> equipment where some, but not all, retained fluid-wetted surfaces are either weld overlaid or weld clad with a corrosion-resistant alloy or an austenitic stainless steel to resist metal-loss corrosion”</p>
4.3.1.1	<p>Add the following note at the end of the clause:</p> <p>“NOTE Information on design analysis and load capacities of flanges specified in this International Standard can be found in API Technical Reports 6AF, 6AF1, and 6AF2.”</p>

- 4.3.4 Replace “Bolting stresses, based on the root area of the thread, shall not exceed the limit given in Equation (9):” with:  
“Bolting stresses, based on the minimum cross-sectional area of the bolting, shall not exceed the limit given in Equation (9):”
- 5.4.3.1 b) Replace with:  
“b) PSL 2 and PSL 3 requirements:  
The requirements for PSL 2 and PSL 3 are identical to the requirements for PSL 1. In addition the manufacturer shall document foundry practices which establish limits for sand control, core-making, rigging, melting and heat treatment and NDE, to ensure repeatability in producing castings which meet the requirements of this International Standard.”
- 5.4.3.1 c) Replace with:  
“c) PSL 4 requirements:  
Wrought products shall be used.”
- 5.6.2 c) Replace the second bullet with:  
“— casting: size not required to exceed size shown in ASTM A703/A703M.”
- 5.6.4.1 Replace the fifth paragraph with:  
“Standard size 12,5 mm (0,500 in) diameter tensile specimens shall be used to qualify carbon, low-alloy and stainless steels, unless the physical configuration of the TC prevents their use. In this case, the standard sub-size specimens referenced in ASTM A370 may be used. Either standard 12,5 mm (0,500 in) or standard sub-size specimens (see ASTM A370) may be used to qualify CRA materials.”
- 5.7.4.1 Replace the sixth paragraph with:  
“Standard size 12,5 mm (0,500 in) diameter tensile specimens shall be used, unless the physical configuration of the QTC prevents their use. In this case, the standard sub-size specimens referenced in ASTM A370 may be used.”
- 6.5.1.1 Replace the subclause title with:  
**“6.5.1.1 Corrosion-resistant overlay (including ring grooves and other corrosion-resistant overlay)”**
- 6.5.1.1.1 Replace the sentence in the subclause with:  
“The provisions of 6.5.1.1 apply to use of corrosion-resistant weld overlay for bodies, bonnets, clamp hub end connectors, and end and outlet connectors (including ring grooves). These requirements do not apply to hard facing or to the weld overlay of valve-bore sealing mechanisms, choke trim or valve stems.”

## 6.5.1.1.2

Replace the entire subclause with:

**“6.5.1.1.2 Welding procedure/performance qualification**

Qualification shall be in accordance with ASME, BPVC:2004, Section IX, Articles II and III, for weld overlay.

The following apply:

a) chemical analysis:

Chemical analysis shall be performed on the weld metal in accordance with the requirements of ASME, BPVC:2004, Section IX, at a location 3 mm (0,125 in) or less from the original base-metal surface. The chemical composition of the deposited weld metal at that location shall be as specified by the manufacturer or where applicable in this specification. For austenitic or 300 series stainless steels, the chemical composition shall be as given in Table 13.

**Table 13— Chemical composition of austenitic or 300 series stainless steels**

Element	Composition % mass fraction
Nickel	8,0 min.
Chromium	16,0 min.
Carbon	0,08 max.

For other compositions that are required to conform to the requirements of ISO 15156 (all parts) (NACE MR0175; see Clause 2), the chemical analysis of the overlay shall conform to the specification limits of the corresponding ISO 15156 (all parts) (NACE MR0175; see Clause 2)-approved material(s).

For nickel-based alloy UNS N06625, the chemical composition shall meet one of the classes given in Table 15.

For all other compositions, the chemical analysis of the overlay shall conform to the specified limits of the manufacturer’s written specification.

**Table 14 — This table intentionally left blank**

**Table 15 — Chemical composition of the nickel-based alloy UNS N06625**

Class	Element	Composition % mass fraction
Fe 5	Iron	5,0 max.
Fe 10	Iron	10,0 max.

b) mechanical properties:

The base metal material shall retain the minimum mechanical property requirements after post-weld heat treatment. The manufacturer shall specify the methods to assure these required mechanical properties and record the results as part of the PQR.

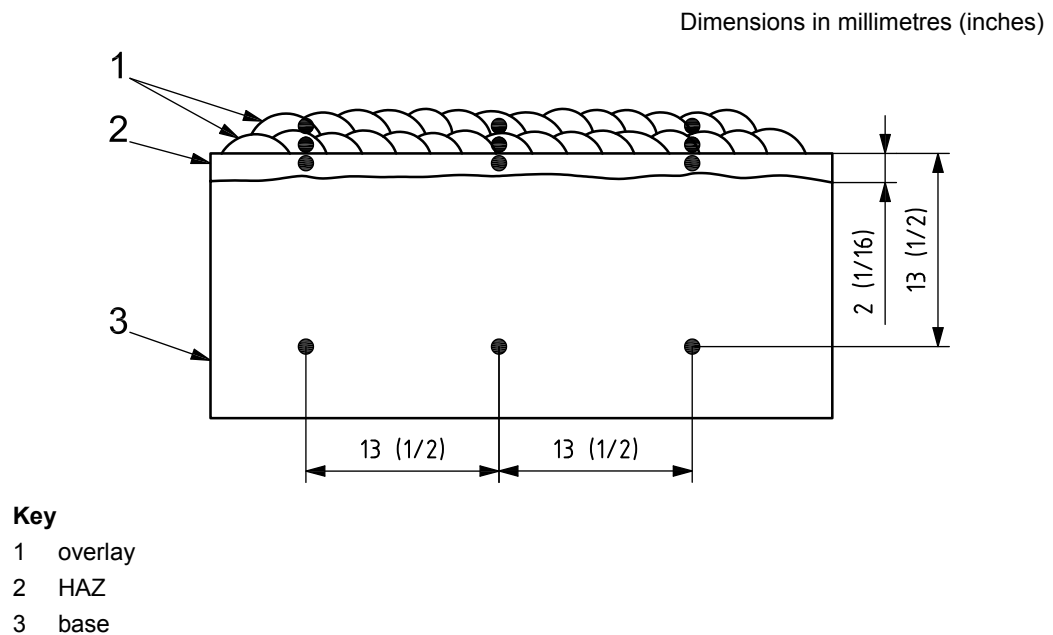
If the overlay material is not considered as part of the manufacturer’s or this International Standard’s design criteria, a tensile test and an impact test of the overlay material are not required. Other than ring grooves, if the overlay material is considered as part of the manufacturer’s design criteria or where dimensions for the

product are specified in this International Standard, mechanical testing per Clause 5 of the overlay material is required. If overlay material is only part of the manufacturer's design criteria, acceptance criteria for mechanical testing of the overlay material shall be as specified in Clause 5, or as established by design analysis and specified by the manufacturer.

For ring grooves where weld preparations specified in Table 52 are used, mechanical testing per Clause 5 of the overlay material is not required. Other weld preps may be used but mechanical testing per Clause 5 of the overlay material is required to demonstrate the mechanical properties of the deposited weld metal equal or exceed those of the base metal.

- c) weld conformance to ISO 15156 (all parts) (NACE MR0175; see Clause 2):

Welds for use in hydrogen sulfide service shall conform to the requirements of ISO 15156 (all parts) (NACE MR0175; see Clause 2). If the welding procedure is to be qualified for use on bodies, bonnets or flanges used for material classes DD, EE, FF or HH, hardness testing shall be carried out by the Rockwell method in accordance with ISO 6508 (all parts) or ASTM E18, or the Vickers 98 N method in accordance with ISO 6507 (all parts) or the Vickers 10 kgf method in accordance with ASTM E92. Hardness tests shall be performed at a minimum of three test locations in each of the base material, the heat-affected zone and in each layer of overlay up to a maximum of two layers. See Figure 6 for required hardness test locations.



**Figure 6 — Hardness test locations for weld overlays**

- d) guided-bend tests:

Guided-bend tests and acceptance criteria shall be in accordance with ASME, BPVC:2004, Section IX, to confirm weld overlay/base material bond integrity.”

- 6.5.1.1.3 Replace with:  
**“6.5.1.1.3 Base material conformance to ISO 15156 (all parts) (NACE MR0175; see Clause 2)”**
- Where the base material is required to meet ISO 15156 (all parts) (NACE MR0175; see Clause 2), the base material shall conform to ISO 15156 (all parts) (NACE MR0175; see Clause 2) after weld overlay and any subsequent heat treatments.”
- 6.5.1.2 Delete in its entirety (including Table 14, Table 15, and Figure 6).
- 6.5.1.3 Replace the subclause title and the first sentence with:  
**“6.5.1.2 Hard facing or other types of weld overlay”**
- The use of weld overlay for hard facing or for purposes other than those covered by 6.5.1.1 does not require a welding procedure/performance qualification.”
- 6.5.1.4 Replace the subclause title and text with:  
**“6.5.1.3 Repair of weld overlays”**
- Repairs of weld overlays, including associated base metal build-up using the overlay material, are acceptable only provided that
- a) the original applicable requirements (6.5.1.1 ) are adhered to;
  - b) if the weld overlay material and/or base metal build-up for the weld overlay are considered part of the design criteria of the manufacturer or of the design criteria of this International Standard, those properties listed in the design criteria are met;
  - c) weld overlay repairs and associated base metal build-up for use in hydrogen-sulfide service conform to the requirements of ISO 15156 (all parts) (NACE MR0175; see Clause 2). Weld repairs of the base metal that are not associated with the weld overlays are not allowed for PSL 4 equipment.”
- 6.5.2.2 Replace the sentence in the subclause with:  
“Qualification shall be in accordance with ASME, BPVC:2004, Section IX, Articles II and III, for weld overlay, hard facing or other types of overlay, as applicable.”
- 6.5.2.5 Replace the second sentence with:  
“For the use of weld overlay for purposes other than those covered in 6.5.1.1, welding procedure/performance qualification requirements are not specified.”
- 7.4.2.1.4 c) Replace the first sentence with:  
“The end and outlet connection threads shall be in accordance with Tables 61 and B.61, API Spec 5B or ASME B1.1, ASME B1.2, and ASME B1.3, as applicable.”
- 7.4.2.1.5 b) Replace the last paragraph with:  
“Visual examination of forgings and weld preps (when required by Table 18) shall be performed in accordance with manufacturer’s written specifications.”
- 7.4.2.1.5 c) 2) Replace with:  
“2) for forgings and weld preps (when required by Table 18): in accordance with manufacturer’s written specifications.”

## 7.4.2.1.6

Replace the entire subclause with:

**“7.4.2.1.6 Weld NDE — General**

If examination is required (see Table 18), for all weld types, the essential welding variables and equipment shall be monitored; welding activities shall be audited; and completed weldments [a minimum of 13 mm ( ½ in) of surrounding base metal and the entire accessible weld] shall be examined in accordance with the methods and acceptance criteria of Table 18.

The manufacturer’s written specification for corrosion-resistant weld overlay shall include a technique for measuring the specified overlay thickness.

## 7.4.2.1.7

Insert entirely new subclause:

**7.4.2.1.7 Weld overlay volumetric inspection**

Other testing requirements:

Measurement of overlay thickness, testing of bond integrity and volumetric examination shall be according to the manufacturer’s written specifications.

If the overlay is considered part of the manufacturer’s design criteria or of the design criteria of this International Standard, volumetric examinations shall be in accordance with the following:

## a) sampling:

As far as practical, the entire volume of weld overlay plus the 3 mm (0.125 in) of adjacent base metal on all sides shall be examined using ultrasonic examination after heat treatment for mechanical properties and prior to machining operations that limit effective interpretation of the results of the examination.

NOTE This may require intermediate machining operation to meet surface finish requirements without limiting the effectiveness of results.

## b) test methods:

— Weld overlay shall be examined using ultrasonic examination performed in accordance with the flat-bottom-hole procedures specified in ASTM A388/388M, except that the immersion method may be used, and ASTM E428.

— Calibration: The distance amplitude curve (DAC) shall be based on 3,2 mm ( ½ in) flat-bottom hole.

## c) acceptance criteria:

— No single indication exceeding reference distance amplitude curve.

— No multiple indications exceeding 50 % of reference distance amplitude curve. Multiple indications are defined as two or more indications (each exceeding 50 % of the reference distance amplitude curve) within 13 mm ( ½ in) of each other in any direction.”



Table 17

Replace with:

**Table 17 — Quality control requirements for bodies, bonnets, end and outlet connections and clamp hub end connectors**

Parameter	Subclause reference			
	PSL 1	PSL 2	PSL 3/3G	PSL 4
Tensile testing	7.4.2.1.1	7.4.2.2.1	7.4.2.2.1	7.4.2.2.1
Impact testing	7.4.2.1.2	7.4.2.2.2	7.4.2.3.2	7.4.2.4.2
Hardness testing	7.4.2.1.3	7.4.2.2.3	7.4.2.3.3	7.4.2.3.3
ISO 15156 (all parts) (NACE MR0175; see Clause 2)	7.4.1.5	7.4.1.5	7.4.1.5	7.4.1.5
Dimensional inspection	7.4.2.1.4	7.4.2.1.4	7.4.2.3.4	7.4.2.3.4
Traceability	—	7.4.2.2.5	7.4.2.3.5	7.4.2.3.5
Chemical analysis	—	7.4.2.2.6	7.4.2.2.6	7.4.2.2.6
Visual examination	7.4.2.1.5	7.4.2.1.5 7.4.2.2.7	—	—
Surface NDE	—	7.4.2.2.8 7.4.2.2.9	7.4.2.3.8	7.4.2.3.8
Weld NDE  General	7.4.2.1.6	7.4.2.1.6	7.4.2.1.6	No welding permitted except for weld overlays (see 7.4.2.4.9)
Serialization	—	—	7.4.2.3.14	7.4.2.3.14
Volumetric NDE	—	—	7.4.2.3.15	7.4.2.4.11

7.4.2.2.12 a)

Replace the sentence in the subclause with:

100% of all pressure-containing fabrication welds and weld overlay shall be examined by either magnetic-particle (in the case of ferromagnetic materials) or liquid-penetrant (in the case of ferromagnetic or non-ferromagnetic materials) methods after all welding, post-weld heat treatment and machining operations.

7.4.2.3.15 b) 1)

Add the following after the first bullet:

“— castings: Ultrasonic examinations of castings shall be performed in accordance with the flat bottom hole procedures specified in ASTM A609 (except immersion method may be used) and ASTM E428.”

7.4.2.3.15 c) 1)

Replace the sentence in the subclause with:

“Radiographic examination of hot-worked parts or castings shall be performed in accordance with methods specified in 7.4.2.2.14.”

Table 18 Replace with the following:

**Table 18 — Quality control requirements for welding bodies, bonnets and end and outlet connections**

Weld type	Stages	PSL 1	PSL 2	PSL 3/PSL 3G	PSL 4
Pressure-containing	Preparation				
	Visual	-	-	7.4.2.1.5	No welding permitted
	Completion				
	Visual	-	7.4.2.2.11	7.4.2.2.11	
	Surface NDE	-	7.4.2.2.12	7.4.2.3.11	
	Volumetric NDE	-	7.4.2.2.14	7.4.2.3.12	
Hardness test	-	-	7.4.2.3.13		
Non-pressure-containing	Preparation				
	Visual	-	-	7.4.2.1.5	No welding permitted
	Completion				
	Visual	-	7.4.2.2.11	7.4.2.2.11	
Hardness test	-	-	7.4.2.3.13		
Pressure-containing repairs	Preparation				
	Surface NDE	-	7.4.2.2.13	7.4.2.2.13	No welding permitted
	Completion				
	Visual	-	7.4.2.2.11	7.4.2.2.11	
	Surface NDE	-	7.4.2.2.12	7.4.2.3.11	
	Volumetric NDE	-	7.4.2.2.14	7.4.2.3.12	
Hardness test	-	-	7.4.2.3.13		
Weld metal overlay — partial overlay	Preparation				
	Surface NDE	-	-	7.4.2.3.8	7.4.2.4.8
	Completion				
Weld metal overlay — full overlay	Surface NDE	-	7.4.2.2.12	7.4.2.3.11	7.4.2.4.8
	Preparation				
Weld metal overlay — full overlay	Visual	7.4.2.1.5	7.4.2.1.5	7.4.2.1.5	7.4.2.1.5
	Completion				
	Visual	7.4.2.2.11	7.4.2.2.11	7.4.2.2.11	7.4.2.2.11
	Surface NDE	7.4.2.2.12	7.4.2.2.12	7.4.2.3.11	7.4.2.4.8
	Volumetric NDE	-	-	7.4.2.1.7	7.4.2.1.7
NOTE	<p>“Preparation” refers to surface preparation, joint preparation, fit-up and preheat.</p> <p>“Completion” refers to after all welding, post-weld heat treat and machining, except for volumetric NDE which shall be done prior to machining that would limit effective interpretation of results.</p>				

7.4.2.3.15 c) 2)

Add the following at the end of the subclause:

“— The following acceptance criteria apply to cast parts:

ASTM E186, *Standard Reference Radiographs for Heavy-Walled (2 to 4½ in.) Steel Castings*.

ASTM E280, *Standard Reference Radiographs for Heavy-Walled (4½ to 12 in.) Steel Castings*.

ASTM E446, *Standard Reference Radiographs for Steel Castings Up to 2 in. in Thickness*.

Maximum defect classification as follows:

Type Defect	Maximum Defect Class
A	2
B	2
C	2 (all types)
D	none acceptable
E	none acceptable
F	none acceptable
G	none acceptable”

- 7.4.10.1.2 c) Replace the sentence in the subclause with:  
“Acceptance criteria for critical dimensions shall be in accordance with the manufacturer’s specification. The end and outlet connection threads shall be in accordance with Table 61 and Table B.61, API Spec 5B or ASME B1.1, ASME B1.2 and ASME B1.3, as applicable.”
- 7.4.11 Replace the subclause title with:  
“**7.4.11 Bullplugs, valve-removal plugs and back-pressure valves** (see Table 38)”
- Table 39 Replace “ISO 10423” with “ISO 10423 and/or API 6A” in the first row.
- 8.1.1 Add the following at the end of the subclause:  
“Manufacturers shall mark their equipment with ‘API 6A’ in addition to or in place of ‘ISO 10423’ in the location specified in this clause. As a minimum, equipment should be marked with US Customary Units.”
- 8.1.5 Replace the first sentence with:  
“The thread type marking, in accordance with API 5CT/ISO 11960, shall be as follows:”
- 8.1.9 b) Replace with:  
“Clamp hub end connectors shall be marked ‘API 16A’ in addition to or in place of ‘ISO 13533’ following the size and pressure rating.”
- 8.2 Replace the second paragraph with:  
“Wellhead outlets with valve removal preparations shall be marked near the outlet with ‘API 6A’ in addition to or in place of ‘ISO 10423’ followed by the nominal size and “VR” for 69,0 MPa (10 000 psi) working pressure or “HP VR” for 138,0 MPa (20 000 psi) working pressure.”
- 8.5 e) Replace with:  
“Mark the letter “V” after “API 6A” in addition to or in place of “ISO 10423”.”
- 8.5 f) Replace the first sentence with:  
“Safety valves meeting the requirements of 10.20 shall be marked with the letters “SSV” or “USV” following “API 6A” in addition to or in place of “ISO 10423”.”
- 8.10 Replace with:  
“Valve-removal plugs shall be marked with “API 6A” in addition to or in place of “ISO 10423” followed by the nominal size and “VR” for 69,0 MPa (10 000 psi) working pressure or “HPVR” for 138,0 MPa (20 000 psi) working pressure, material class and manufacturer’s name or mark, as a minimum.”
- 8.11 Replace the first sentence with:  
“Bullplugs shall be marked with “API 6A” in addition to or in place of “ISO 10423” followed by the nominal size, material class and manufacturer’s name or mark, as a minimum.”

8.12 Replace with:  
 “Back-pressure valves shall be marked with “API 6A” in addition to or in place of “ISO 10423” followed by the nominal size, working pressure, material class and manufacturer’s name or mark, as a minimum.”

Table 49 Replace “tol.” column values for **Outside diameter of flange** with “±” the stated value.

Table 50 Replace “tol.” column values for **Outside diameter of flange** with “±” the stated value.

10.3.3.5 a) Replace with:  
 “a) for ASTM A194 grades 2HM and 7M:  
 ASTM A194/A194M grades 2HM and 7M are acceptable for all flange sizes and rated working pressures.”

Table 62 Replace the last section of the table with:

Nuts							
ASTM spec. and grades, heavy	A194/A194M 2H, 2HM, 4, 7 or 7M	A194/A194M 2H, 2HM, 4, 7 or 7M	A194/A194M 2H, 2HM, 4, 7 or 7M	A194/A194M 2H, 2HM, 4, 7 or 7M	A194/A194M GR 2HM or 7M	A194/A194M GR 2HM or 7M	A194/A194M GR 2HM or 7M
Hardness as per ISO 15156 (all parts) (NACE MR0175; see Clause 2)	No	No	No	No	Yes	Yes	Yes
Charpy testing required	No	No	No	No	No	No	No

10.7.3.7 Replace with:  
 “Slip-type hangers and sealing systems to seal on casing or tubing shall be designed to accommodate the OD pipe tolerance as specified in API 5CT/ISO 11960.”

10.8.3.2 b) Replace the first sentence with:  
 “The upper connector of an independent adapter shall be flanged or studded, in accordance with 10.1, or threaded, in accordance with 10.2, or have an other-end connector in accordance with 10.18 or clamp hubend connectors in accordance with API 16A/ISO 13533 or swivel flanges in accordance with API 17D/ISO 13628-4.”

10.14.3.4 Replace the second sentence with:  
 “Restricted-area pack-offs to seal on casing or tubing shall be designed to accommodate the OD pipe tolerances as specified in API 5CT/ISO 11960.”

10.20.2.3 Replace the first and second bullets with:  
 “— USV valves may use end connections as specified in API 17D/ISO 13628-4.  
 — USVs may be of non-standard bores and/or face-to-face lengths. End connections shall meet all other requirements of this International Standard. Reduced-opening USV flow ports should be sized after consideration of through-flowline (TFL) operations, as specified in API 17C/ISO 13628-3.”

Figure A.9 Replace  
 “SSV/USV Valve  
 Performance test agency  
 (PR2 SSV/USV Valves)\_\_\_\_\_”  
 with:  
 “SSV/USV Valve  
 Performance test agency  
 (Class II SSV/USV valves)\_\_\_\_\_”

Table F.1 Replace Valves, gate and plug / Allowable leakage entry with:  
 “30 cm<sup>3</sup>/hr/25,4 mm of nominal bore size”

Table F.1 Replace Hangers / Allowable leakage entry with:  
 “10 cm<sup>3</sup>/hr/25,4 mm of nominal bore size”

Table G.4 Replace the header row with:

Material	Derating factor $Y_r$			Comment
	149 °C (300 °F)	177 °C (350 °F)	232 °C (450 °F)	

H.5 Replace with:  
 “All tools should be marked “API 6A” in addition to or in place of “ISO 10423” and also as indicated in API 7-1/ISO 10424-1:2004, 5.6, below the tool joint tong space, as a minimum. Wear bushings shall be marked “API 6A” and/or “ISO 10423” followed by the drift internal diameter, expressed in millimetres and inches. A unique serial number shall be die-fixed to each tool assembly, preferably in a milled recess.”

I.1.4 Replace the third sentence in the subclause with:  
 “The successful completion of the test shall qualify all sizes and all pressure ratings of that manufacturer’s SSV/USV of the same basic design and materials of construction for the intended class of service.

NOTE <deleted>”

I.2.3.1 Replace the entire subclause with:  
 “**I.2.3.1 Freshwater tank**, with a minimum capacity of 0,8 m<sup>3</sup> (5 bbl) and equipped with a low level pump shutdown control.”

I.2.3.2 Replace the first paragraph with:  
 “**I.2.3.2 Sand slurry tank and associated accessories**, consisting of a cylindrical, cone-bottom sand slurry tank with a minimum capacity of 0,8 m<sup>3</sup> (5 bbl), equipped with an agitation device as required to obtain proper slurry consistency.”

L.6.1 Add the following sentence to the beginning of the subclause:  
 “VR plugs and plug preparations shall be dimensionally inspected.”

L.6.2

Replace the sentence with:

“HP VR plugs and plug preparations shall be dimensionally inspected. Inspection methods shall be in accordance with the manufacturer’s documented procedures.”

L.7

Replace with:

“Valve-removal plugs shall be marked with “API 6A” in addition to or in place of “ISO 10423” followed by the nominal size and “VR” for 69,0 MPa (10 000 psi) working pressure or “HP VR” for 138,0 MPa (20 000 psi) working pressure and material class, as a minimum.”