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Addendum 2

Foreword: The following paragraph shall be deleted from the Foreword:

For API Monogram Program licensees and APIQR Program registrants, this standard shall become effective on the program date printed on the cover but may be used voluntarily from the date of publication.

Section 1 (Scope): The following paragraph shall be deleted:

If product is supplied bearing the API Monogram and manufactured at a facility licensed by API, the requirements of Annex A apply.

Section 2 (Normative References): The following reference shall be added:

ASTM E127, *Standard Practice for Fabrication and Control of Flat Bottomed Hole Ultrasonic Standard Reference Blocks*

Section 2 (Normative References): The following reference shall be deleted:

ASTM E428, *Standard Practice for Fabrication and Control of Metal, Other than Aluminum, Reference Blocks Used in Ultrasonic Testing*

6.1: The section shall be changed to the following:

Bodies, bonnets, end and outlet connectors, clamp hub end connectors, hangers, and pressure boundary penetrations shall meet the requirements of Section 6. Other Pressure-containing and pressure-controlling parts shall be made of materials that satisfy 6.2.1 and the requirements of Section 4 and Section 5.

Material requirements in Section 6 shall apply to carbon steels, low-alloy steels, and martensitic stainless steels (other than precipitation-hardening types). Other alloy systems (including precipitation-hardening stainless steels) shall satisfy the applicable requirements of Section 4, Section 5, and Section 6.

Age-hardened nickel-based alloys for pressure-containing and pressure-controlling parts that are addressed in API 6ACRA shall conform to API 6ACRA.

NOTE Section 14.13.3 provides material requirements for hangers.

Materials for actuators shall be as specified in 14.16.3.

6.1.1: The following header shall be added after 6.1:

6.1.1 Applicability and Alloys

6.1.2: *The following section shall be added:*

6.1.2 Material Forming Processes

PSL 1, PSL 2, and PSL 3 bodies, bonnets, end and outlet connectors (including clamp hub end connectors) shall be manufactured from either wrought or cast materials.

PSL 4 bodies, bonnets, end and outlet connectors (including clamp hub end connectors) shall be manufactured from wrought materials.

6.3.5.3: *The following section shall be deleted:*

6.3.5.3 Tolerance Ranges

Table 13: The following table shall be deleted:

Table 13—Maximum Tolerance Range Limits for Alloying Elements (PSL 3 and PSL 4)

The Table 13 title line shall be replaced by the following:

Table 13 (intentionally removed with Addendum 2)

6.4.2.3.1: *The section shall be changed to the following:*

For PSL 1, PSL 2, PSL 3, and PSL 4, the ER of the QTC shall be equal to or greater than the ER of the part it qualifies as determined by using the dimensions of the part in the as-heat-treated condition.

NOTE See 6.1.2 for limitations on castings

6.4.2.3.2: *The 5th paragraph shall be changed to the following:*

For PSL 3, for carbon and low-alloy steel, excluding 2¹/₄ Cr1Mo, bodies that require a design yield strength of 75K or greater and where the part's weight during heat-treat is greater than 454 kg (1000 lb), the QTC ER shall be the same or greater than the part it qualifies, but is not required to exceed 254 mm (10 in.), with the following exception.

6.4.2.3.2: *The 2nd, 3rd, and 4th bullets below the EXCEPTION shall be changed to the following:*

- a qualification forging or a sacrificial part is used to validate the mechanical properties that satisfy the acceptance criteria of the analysis at a depth of 63 mm (2.5 in.) or T/4, whichever is less, at the critical section(s) as identified by the stress distribution in the design documentation;
- a qualification forging or a sacrificial part is used to document that the part meets the Charpy impact requirements of this specification at a depth of 63 mm (2.5 in.) or T/4 of the critical section(s) of the parts, whichever is less; and
- a qualification forging or a sacrificial part having the same heat-treat geometry, material grade, and heat-treat parameters as defined by the manufacturer is used to qualify all the production parts covered by the analysis.

6.4.3.3.1: The section shall be changed to the following:

Batch heat-treatment shall be performed using equipment qualified in accordance with 6.5.

For PSL 1, PSL 2, and PSL 3, the QTC shall experience the same specified heat-treatment processing as the part(s) it qualifies. The QTC shall be heat-treated using the manufacturer's specified heat-treating procedure(s). If the QTC is not heat-treated as part of the same heat-treatment lot as the part(s) it qualifies, the austenitizing, solution-treating, or age-hardening (as applicable) temperatures for the QTC shall be within 14 °C (25 °F) of those for the part(s). The tempering temperature for the part(s) shall not be lower than 14 °C (25 °F) below that of the QTC. The upper limit shall not be higher than that permitted by the heat-treat procedure for that material. The cycle time at each temperature shall not exceed that for the part(s).

For PSL 3, for mandrel hangers where the design requires a material designation of 75K or greater and for bodies where the design requires a material designation of 75K or greater and where the weight of the body during heat-treat is greater than 454 kg (1000 lb), the QTC shall be heat-treated in the same heat-treat furnace and same quench tank as the production parts that it qualifies.

For PSL 4 only, the mechanical testing shall be performed per heat per heat-treat lot. The test specimens shall be removed from a prolongation or production part from each heat and each heat-treat lot. Individual prolongations or production parts corresponding to each quench shall be used for multiple quench batches from the same furnace load.

NOTE The batch heat-treatment requirements of PSL 4 do not apply to PSL 1, PSL 2, and PSL 3.

7.3.4.6: Below the 1st paragraph, the 2nd bullet shall be changed to the following:

- Results of testing in the weld and base-material HAZ shall meet the requirements specified for the design of the part. Records of results shall become part of the PQR. Any retests of impact testing shall be in accordance with ISO 148-1 or ASTM A370.

Table 16: The table shall be changed as indicated by the red boxes:

	Pressure Rating MPa (psi)	Nominal Size (in.)	ASTM Bolting Standard(s) and 0.2 % Offset Yield Strength				
			Nonexposed Bolting		Exposed Bolting		
			A193 GR. B7 ($\leq 2.5''$) A320 GR. L7 ($\leq 2.5''$) A320 GR. L43 ($\leq 4.0''$)	A193 GR. B7 ($> 2.5''$)	A193 GR. B7M ($\leq 4.0''$) A320 GR. L7M ($\leq 2.5''$)	A453 GR. 660D ($\leq 4.0''$) (See 8.2.3.2 and 8.2.3.5) CRA	
			725 MPa (105 ksi)	655 MPa (95 ksi)	550 MPa (80 ksi)	725 MPa (105 ksi) $\leq 2.5''$ 655 MPa (95 ksi) $> 2.5''$	
Studs, Bolts, and Cap Screws	13.8 (2000)	All sizes	✓	NA	✓	✓	
	20.7 (3000)	All sizes	✓	NA	✓	✓	
	34.5 (5000)	All sizes	✓	NA	✓	✓	
	69.0 (10,000)	1 ¹³ / ₁₆ , 2 ¹ / ₁₆ , 2 ⁹ / ₁₆ , 3 ¹ / ₁₆	✓	NA	✓	✓	
		4 ¹ / ₁₆	✓	NA	Unacceptable	✓	
		5 ¹ / ₈	✓	NA	Unacceptable	✓	
		7 ¹ / ₁₆	✓	NA	✓	✓	
		9, 11, 13 ⁵ / ₈ , 16 ³ / ₄ , 18 ³ / ₄ , 21 ¹ / ₄	✓	NA	Unacceptable	✓	
	103.5 (15,000)	1 ¹³ / ₁₆	✓	NA	✓	✓	
		2 ¹ / ₁₆ , 2 ⁹ / ₁₆ , 3 ¹ / ₁₆ , 4 ¹ / ₁₆	✓	NA	Unacceptable	✓	
		5 ¹ / ₈	✓	NA	✓	✓	
		7 ¹ / ₁₆ , 9, 11, 13 ⁵ / ₈	✓	NA	Unacceptable	✓	
		18 ³ / ₄	✓ Gr. L43 only	✓	Unacceptable	✓	
	138.0 (20,000)	1 ¹³ / ₁₆ , 2 ¹ / ₁₆ , 2 ⁹ / ₁₆ , 3 ¹ / ₁₆ , 4 ¹ / ₁₆ , 7 ¹ / ₁₆ , 9	✓	NA	✓	✓	
		11, 13 ⁵ / ₈	✓ Gr. L43 only	✓	✓ Gr. B7M only	✓	
	Nuts	All pressure ratings	All sizes	ASTM A194/A194M GR. 2H, 2HM, 7, 7M		ASTM A194/A194M GR. 2HM, 7M ASTM A453/A453M GR 660D or CRA	
	NOTE ✓ = acceptable.						

10.4.2.12.2: The 1st and 2nd paragraphs shall be changed to the following with the addition of the 3rd paragraph:

For PSL 2 and PSL 3 castings, ultrasonic examinations of castings shall be performed in accordance with the flat-bottom hole procedure specified in ASTM A609 (except that the immersion method may be used) and ASTM E127.

For PSL 3 and PSL 4 wrought material, ultrasonic examination shall be performed in accordance with the flat-bottom hole procedures specified in ASTM A388/A388M (except that the immersion method may be used) and ASTM E127.

Where variation in acoustic response of 2 dBs occurs due to surface finish difference between the test block and the part to be examined, a coupling compensation of up to 12 dB maximum shall be performed.

Table 25: The table shall be changed as indicated by the red box:

Parameter ^{a,b}	Reference			
	PSL 1	PSL 2	PSL 3	PSL 4
Tensile testing	10.4.2.2	10.4.2.2	10.4.2.2	10.4.2.2
Impact testing	10.4.2.3	10.4.2.3	10.4.2.3	10.4.2.3
Hardness testing	10.4.2.4	10.4.2.4	10.4.2.4	10.4.2.4
NACE MR0175/ISO 15156	10.4.1.4	10.4.1.4	10.4.1.4	10.4.1.4
Dimensional inspection	10.4.2.5	10.4.2.5	10.4.2.5	10.4.2.5
Visual examination	10.4.2.6	10.4.2.6	—	—
Chemical analysis	—	10.4.2.7	10.4.2.7	10.4.2.7
Traceability	—	10.4.2.8	10.4.2.8	10.4.2.8
Surface NDE	—	10.4.2.10/10.4.2.11	10.4.2.10/10.4.2.11	10.4.2.10/10.4.2.11
Weld NDE	No welding permitted except for weld overlays	No welding permitted except for weld overlays	No welding permitted except for weld overlays	No welding permitted except for weld overlays
Weld overlay				
General	10.4.3.3	10.4.3.3	10.4.3.3	10.4.3.3
Preparation - Visual	10.4.2.6	—	—	—
Preparation - Surface NDE	—	10.4.2.10/10.4.2.11	10.4.2.10/10.4.2.11	10.4.2.10/10.4.2.11
Completion - Visual	10.4.2.14	10.4.2.14	10.4.2.14	10.4.2.14
Completion - Surface NDE	—	10.4.2.15	10.4.2.15	10.4.2.15
Serialization	—	—	10.4.2.9	10.4.2.9
Volumetric NDE	—	—	10.4.3.2	10.4.3.2
FOOTNOTES				
^a "Preparation" refers to surface preparation, joint preparation, fit-up, and preheat.				
^b "Completion" refers to after all welding, post-weld heat-treat, and machining, except for volumetric NDE that shall be done prior to machining that would limit effective interpretation of results.				

11.2.4.1: The section shall be changed to the following:

For PSL 1, the following shall apply.

- a) The general requirements of 11.1 and 11.2.1 shall apply.
- b) Hydrostatic test pressure shall be not less than the rated working pressure of the valve. Pressure shall be applied to one side of the closed gate, ball, or plug of the valve, with the other side vented to atmosphere. Unidirectional valves shall be tested in the direction indicated on the body, except for check valves, which shall be tested from the downstream side.

NOTE 1 Split-gate valves may have both seats tested simultaneously.

- c) Pressure shall be monitored for the hold periods specified in Table 32, as a minimum.
- d) Test pressure shall be reduced to 0 psig.
- e) Steps b) through d) shall be repeated. During the (secondary) hold period, pressure shall be monitored and the valve monitored for visible leakage.
- f) For a bidirectional valve, steps b) through e) shall be performed on the other side of the gate, ball, or plug using the same procedure outlined above.

NOTE 2 PSL 1 hydrostatic seat test method requirements do not apply to PSL 2, PSL 3, PSL 3G, or PSL 4.

NOTE 3 Methods other than direct observation of the valve bore sealing mechanism may be used for visual leak detection provided that the visual monitoring method has been validated to show fluid leakage when present.

11.2.4.2: The section shall be changed to the following:

For PSL 2, PSL 3, and PSL 4, the following shall apply.

- a) The general requirements of 11.1 and 11.2.1 shall apply.
- b) Hydrostatic test pressure shall be not less than the rated working pressure of the valve. Pressure shall be applied through one side of the flow bore to the closed gate, ball, or plug of the valve, with the other side vented to atmosphere. Unidirectional valves shall be tested in the direction indicated on the body, except for check valves, which shall be tested from the downstream side.
- c) Pressure shall be monitored for the primary hold period specified in Table 32, as a minimum.
- d) The valve, except for check valves, shall be opened while still under full differential pressure. For PSL 3 and PSL 4 only, the operating input required to open the valve while operating under full differential pressure shall be measured.
 - For manual valves, the operating input shall be torque.
 - For valves with hydraulic or pneumatic actuators, the operating input shall be pressure.
 - For valves with electric actuators, the operating input shall be current.

NOTE 1 Measurement of torque or actuator input is not required for PSL 2.

- e) Test pressure shall be applied a second time to the same side of the gate, ball, or plug.
- f) Pressure shall be monitored for the secondary hold period specified in Table 32, as a minimum.

- g) The valve, except for check valves, shall be opened a second time while still under full differential pressure. For PSL 3 and PSL 4 only, the operating input required to open the valve while operating under full differential pressure shall be measured.
- For manual valves, the operating input shall be torque.
 - For valves with hydraulic or pneumatic actuators, the operating input shall be pressure.
 - For valves with electric actuators, the operating input shall be current.
- h) Test pressure shall be applied a third time to the same side of the gate, ball, or plug.
- i) Pressure shall be monitored, and the valve shall be monitored for visible leakage, for the tertiary hold period specified in Table 32, as a minimum.

NOTE 2 Methods other than direct observation of the valve bore sealing mechanism may be used for visual leak detection, provided that the visual monitoring method has been validated to show fluid leakage when present.

- j) Test pressure throughout the valve shall be reduced to 0 psig.

NOTE 3 The valve is not opened under differential pressure after the tertiary seat test.

- k) For a bidirectional valve, steps b) through j) shall be performed on the other side of the gate, ball, or plug using the same procedure outlined above.

NOTE 4 PSL 2, PSL 3, and PSL 4 hydrostatic valve seat test requirements do not apply to PSL 1.

Table 35: The table shall be changed as indicated by the red box:

Equipment Type	Nameplate Required?	Marking Requirements
Loose Fittings and Connectors		
• Blind and test flanges	Optional	14.1.5

Table 38: The table shall be changed to the following:

Required Markings	Required Location(s)
Nominal bore size (if applicable) End and outlet connector size Rated working pressure Ring groove type and number	Outside diameter of flange or face of studded outlet

"API 6A or 6A" deleted

14.3.2.3: *The section shall be changed to the following:*

NOTE 1 End and outlet connectors, equipped with internal threads, may be supplied with or without a thread-entrance counterbore.

Internal threads, furnished without a counterbore, should have the outer angles of 45° to a minimum depth of $P/2$, as illustrated in the figure belonging to Table D.29/Table E.29 and Table D.30/Table E.30.

Internal threads, furnished with a counterbore, should conform to the counterbore dimensions specified in Table D.29/Table E.29 and Table D.30/Table E.30 and the bottom of the counterbore should be chamfered at an angle of 45°.

NOTE 2 As an alternative, counterbore dimensions may be as specified in API 5B.

14.11.2.2.1: *Below item b), subitems 2) and 3) shall be changed to the following:*

- 2) Flanged valves: Flanged face-to-face dimensions shall correspond to the dimensions shown in Table D.22/Table E.22, Table D.23/Table E.23 and Table D.24/Table E.24 as applicable.

Face-to-face dimensions not listed in the tables shall be per manufacturer requirements.

- 3) Valves with studded or any other connector conforming to this specification: There are no requirements for the face-to-face dimensions for these valves.

15.2.2.1: *Below item 1), the 2nd bullet shall be changed to the following:*

- tensile test (if required),

Annex A: Per API Monogram Program direction, this Annex shall be deleted and replaced with the following placeholder:

Annex A

The information in this annex has been intentionally removed.

See API Specification Q1 (Annex A), or the API website for information pertaining to the API Monogram Program and use of the API Monogram on applicable products.

C.1.1: *Item a) shall be changed to the following:*

- a) With the exception of ring grooves and ring gaskets, the inch dimensions with fractional origin are not converted from the exact decimal equivalent, but from the decimal-format value specified in this edition. For example, 2.56 in. are converted just as written: 2.56 in. x 25.4 = 65.0 mm, whereas previous editions converted as follows:

$$2.56 \text{ in.} \Rightarrow 2^{9/16} \text{ in.} = 2.5625 \text{ in.} = 2.5625 \text{ in.} \times 25.4 = 65.1 \text{ mm.}$$

J.1.3: *The following section shall be added:*

J.1.3 Marking

NOTE See Table 37 for marking of weld-neck flanges as applicable.

J.2.3.12: *The section number shall be changed to the following:*

J.2.3.2 Hub Dimensions for Nonstandard Applications

Bibliography: The following entries shall be added, and the section shall subsequently be renumbered:

- [5] API Technical Report 6AF3, *Technical Report on High-Pressure High-Temperature (HPHT) Flange Design Methodology*
- [6] API Standard 6AR, *Repair and Remanufacture of Wellhead and Tree Equipment*
- [13] API Technical Report 6RT, *Guidelines for Design and Manufacture of Surface Wellhead Running, Retrieving, and Testing Tools, Clean-out Tools, and Wear Bushings*
- ...
- [21] API Technical Report 21TR1, *Materials Selection for Bolting*