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ERRATA

This errata corrects editorial errors in the First Edition of API Specification 6AV1.

Page v, Foreword. In the last paragraph, change API address to:

Exploration and Production Department, American Petroleum Institute, 1220 L Street,
N.W., Washington, D.C. 20005

Page 1, Paragraph 1.1, Purpose. Make the following changes:

- Delete item b, "Verify the basic SSV/USV actuator design."
- Change items c and d to b and c.

Page 1, Paragraph 2.2. Change the API address to:

Exploration and Production Department, American Petroleum Institute, 1220 L Street,
N.W., Washington, D.C. 20005

Specification for Verification Test of Wellhead Surface Safety Valves and Underwater Safety Valves for Offshore Service

API SPECIFICATION 6AV1
FIRST EDITION, FEBRUARY 1, 1996



American Petroleum Institute
1220 L Street, Northwest
Washington, D.C. 20005



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Specification for Verification Test of Wellhead Surface Safety Valves and Underwater Safety Valves for Offshore Service

Exploration and Production Department

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**American
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FOREWORD

This specification is under the jurisdiction of the API Committee on Standardization of Valves and Wellhead Equipment. This edition of Spec 6AV1 is the First Edition and was approved by letter ballot.

Other standards under the jurisdiction of this committee include:

API

- Spec 6A *Specification for Wellhead and Christmas Tree Equipment.*
- Spec 6D *Specification for Pipeline Valves (Gate, Plug, Ball, and Check Valves).*
- Bul 6AM *Bulletin on Material Toughness.*
- RP 6AR *Recommended Practice for Repair and Remanufacture of Wellhead and Christmas Tree Equipment*
- Bul 6AF *Bulletin on Capabilities of API Flanges Under Combinations of Load.*
- Bul 6AF1 *Bulletin on Temperature Derating of API Flanges Under Combination of Loading.*
- Bul 6AF2 *Bulletin on Capabilities of API Integral Flanges Under Combination of Loading.*
- Spec 6FA *Specification for Fire Test for Valves.*
- Spec 6FB *Specification for Fire Test for End Connections.*
- Spec 6FC *Specification for Fire Test for Valves with Automatic Backseats.*
- Spec 6FD *Specification for Fire Test for Check Valves.*
- Bul 6F1 *Performance of API and ANSI End Connections in a Fire Test According to API Spec 6FA*
- Bul 6F2 *Fire Resistance Improvements for API Flanges.*
- Spec 6H *Specification for End Closures, Connectors and Swivels.*
- Bul 6J *Bulletin on Testing of Oilfield Elastomers—A Tutorial.*
- Bul 6RS *Bulletin on Referenced Standards for Committee 6, Standardization of Valves and Wellhead Equipment.*

This standard shall become effective on the date printed on the cover but may be used voluntarily from the date of distribution.

Suggested revisions to these recommended practices are invited and should be submitted in writing to: Director, Exploration & Production Department, American Petroleum Institute, 700 North Pearl Street, Suite 1840, Dallas, TX 75201-2845.

Specification for Verification Test of Wellhead Surface Safety Valves and Underwater Safety Valves for Offshore Service

1 Scope

1.1 PURPOSE

The purpose of this specification is to establish requirements to:

- Verify the basic PR1 standard service SSV/USV valve design.
- Verify the basic SSV/USV actuator design.
- Verify the basic PR2 sandy service SSV/USV valve design.
- To demonstrate the verification testing covered by this specification that is required to qualify specific valve bore sealing mechanism manufactured under API Spec 6A for PR2 sandy service safety valves.

1.2 PERFORMANCE REQUIREMENTS

Included are minimum acceptable standards for verification testing of SSVs/USVs for two performance requirement levels. To qualify, a SSV/USV valve must pass the verification test specified in Section 4. The two performance requirement levels are:

a. PR1 Standard Service

This performance requirement level of SSV/USV is intended for use on oil or gas wells that do not exhibit the detrimental effects of sand erosion or fouling.

b. PR2 Sandy Service

This performance level of SSV/USV is intended for use on oil or gas wells where a substance such as sand could be expected to cause a SSV/USV valve failure. This valve must also meet the requirements of performance level PR1 Standard Service.

1.3 VERIFICATION TESTING

The verification testing requirements in this specification are not represented as duplicating actual well conditions. Verification tests that have been completed in accordance with verification testing requirements of API Spec 14D will satisfy the requirements of Spec 6AV1.

1.4 APPENDICES

Appendices to this specification are not requirements. They are included only as guidelines or information.

2 Reference Standards

2.1 GENERAL

This specification includes by reference, either in total or in part, other API, industry, and government standards. Latest editions are applicable, unless otherwise so noted.

API

Manual of Petroleum Measurement Standards, Chapter 10.4: "Sediment and Water".

Manual of Petroleum Measurement Standards, Chapter 15: "Guidelines for the Use of the International System of Units (SI)."

RP 13B *Standard Procedure for Field Testing Drilling Fluids.*

RP 14H *Use of Surface Safety Valves and Underwater Safety Valves Offshore.*

Spec 6A *Wellhead and Christmas Tree Equipment.*

Notes:

- When the latest edition of a referenced standard is specified, it shall become effective on the date printed on its cover but may be used voluntarily from the date of distribution.
- Only those standards listed in 2.1 are considered part of this specification. Documents (subtier) that are referenced by those standards are not considered part of this specification.

2.2 REQUIREMENTS

Requirements of other standards included by reference in this specification are essential to the safety and interchangeability of the equipment produced.

For information on submitting equivalent standards for inclusion in this specification, contact the API Exploration and Production Department, 700 North Pearl, Suite 1840 (LB-382), Dallas, Texas 75201-2845.

2.3 EQUIVALENT STANDARDS

Standards reference in this specification may be replaced by other international or nation standards that can be shown to meet or exceed the requirements of the referenced standard. Manufacturers who use other standards in lieu of standards referenced herein are responsible for documenting the equivalency of the standards.

3 Abbreviations and Definitions

3.1 ABBREVIATIONS

The following abbreviations are used in this specification.

ANSI: American National Standards Institute

ASME SPPE: Refers to the program described in ASME SPPE 1 and 2.

3.2 DEFINITIONS

The definitions below are related specifically to surface safety and/or underwater safety valves and are presented to define the terminology used in this specification.

3.2.1 Authorized Facility: A facility authorized under the applicable quality assurance program specified by the operator on the purchase order.

3.2.2 Authorized Quality Assurance Program: API or SPPE Quality Program.

3.2.3 Failure: Improper performance of a device or equipment item that prevents completion of its design function.

3.2.4 Surface Safety Valve (SSV): An automatic wellhead valve assembly which will close upon loss of power supply. When used in this specification it includes the SSV valve and SSV actuator.

3.2.5 SSV/USV Actuator: The device which causes the SSV/USV valve to open when power is supplied and to automatically close when power is lost or released.

3.2.6 SSV/USV Valve: The portion of the SSV/USV which contains the wellstream and shuts off the flow when closed.

3.2.7 Test Agency: Any independent third party which provides a test facility and administers a testing program which meets the PR2 SSV/USV valve verification test requirements of this specification.

3.2.8 Underwater Safety Valve (USV): An automatic valve assembly (installed at an underwater wellhead location) which will close upon loss of power supply. When used in this specification this includes the USV valve and USV actuator.

4 Verification Testing

4.1 GENERAL

Included in this section are the SSV/USV verification testing requirements for the two performance requirement levels defined in 1.2.

4.2 PR1 STANDARD SERVICE SSV/USV VERIFICATION TESTING

To verify a specific PR1 Standard Service SSV/USV design, the manufacturer must test in accordance with the procedures in 4.5 and 4.6 of this specification after completion of factory acceptance tests per 7.5.9, PSL 2 requirements, of API Spec 6A; using water or other suitable fluids for test media. Qualification for PR2 Sandy Service also qualifies the SSV/USV for PR1 Standard Service.

4.3 PR2 SANDY SERVICE SSV/USV VALVE VERIFICATION TESTING

To qualify a specific SSV/USV valve design for PR2 Sandy Service, the manufacturer must submit an SSV/USV valve of the same basic design and materials of construction tested in accordance with API Specification 6A, 7.5.9, PSL 2 requirements, for a verification test by a Test Agency which meets the requirements of 4.4. An example design for the test facility and detailed test procedures are included in Section 4 of this specification. Verification testing at a Test Agency is not required for SSV/USV equipment other than the valve bore sealing mechanism, PR2 Sandy Service.

4.4 TEST AGENCY

The Test Agency shall meet the following minimum requirements: An independent third party, who wishes to conduct verification tests as a service to manufacturers or operators, shall provide a facility, personnel, written procedures, and form to assure conformance with all verification test requirement of this specification, including procedures to assure conformance with all Test Agency requirements specified in 4.9. The Test Agency shall publish literature which includes as a minimum:

4.4.1 A description of the facility including any limitations on size or pressure rating of SSV/USV that may be tested.

4.4.2 The test procedures and forms actually used at the facility.

4.4.3 The test procedures for maintenance and calibration of measuring equipment.

4.4.4 The basis for determining test scheduling priorities.

4.4.5 The procedures for making application for test, delivery of SSVs/USVs, initial installation and checkout of SSVs/USVs, and other pertinent information.

4.4.6 Any limitations on accessibility of the facility. Such limitations should not preclude reasonable access to the facility for inspection by manufacturers or operators.

4.4.7 Any limitations on receipt of proprietary information.

4.4.8 Any other information considered pertinent by the Test Agency.

a. The above literature shall be kept current and shall be furnished to manufacturers or operators upon written request. The Test Agency shall be responsible for assuring themselves, the manufacturer, and the operator that their facility, procedures, and forms comply with this specification.

4.4.9 The Test Agency must meet the criteria of this specification and applicable requirements of API Spec Q1 or the criteria of ASME SPPE-2, *Accreditation of Testing Laboratories for Safety and Pollution Prevention Equipment Used in Offshore Oil and Gas Operations*.

Test Agencies must be licensed by API or accredited in accordance with the requirements of ASME SPPE-2, *Accreditation of Testing Laboratories for Safety and Pollution Prevention Equipment Used in Offshore Oil and Gas Operations*, in order to test SSV/USV equipment that is intended to be marked with the API Monogram or the ASME SPPE OCS Symbol. See Appendix A of this specification for API licensing procedures or contact ASME for SPPE-2 accreditation criteria.

4.5 VERIFICATION TEST REQUIREMENTS

4.5.1 Unless otherwise noted on the SSV/USV valve manufacturer's application for official PR2 Sandy Service SSV/USV Valve Verification Test, a flanged, 2 $\frac{1}{16}$ in. (52 mm), 5,000 psi (34.5 MPa) rated working pressure SSV/USV valve shall be used for the official qualifying test. Successful completion of the official test shall qualify all sizes and all pressure ratings of that manufacturer's SSV/USV valves of the same basic design and materials of construction for Performance Requirements Level PR2 Sandy Service. Any significant change in the design or materials of construction which would affect the SSV/USV valve bore sealing mechanism shall require requalification by verification testing.

4.5.2 The SSV/USV valve manufacturer must declare that a SSV/USV valve of a specific design and materials of construction is being submitted for the official PR2 Sandy Service SSV/USV Valve Verification Test by submitting a formal application to the Test Agency. The application form shall contain the minimum information shown in Table 1.

a. If a particular SSV/USV valve has design or operational features which are incompatible with the test facility and test procedures required by this specification, the manufacturer shall advise the Test Agency of the nature of the incompatibility and shall request and fully describe on the test application, or attachment thereto, any nonspecified equipment or procedures required to test the SSV/USV valve. Responsibility for furnishing and installing nonspecified equipment

shall be by agreement between the Test Agency and the manufacturer. The manufacturer shall document that such nonspecified equipment or procedures are not less stringent than requirements of this specification.

b. The Test Agency shall conduct the test as specified on the SSV/USV valve manufacturer's test application. Any variation from the verification test requirements of this specification shall be prominently recorded on the test data form by the Test Agency.

4.5.3 The SSV/USV valve manufacturer shall provide the Test Agency with one SSV/USV valve, in exact accordance with the data supplied with the manufacturer's test application, completely assembled with an SSV/USV actuator of the SSV/USV valve manufacturer's choice, and hydrostatically and functionally tested in accordance with 7.5.9 of API Spec 6A. The SSV/USV shall be furnished with an appropriate operating manual. If other than a flanged, 2 $\frac{1}{16}$ in. (52 mm) valve, manufacturer shall also furnish to the Test Agency all piping components necessary to install the SSV/USV in the facility test loop, unless the manufacturer has made other arrangements with the Test Agency. The test valve may be either a prototype or production model.

4.5.4 The Test Agency shall record the results of the official verification test on forms which contain the minimum data specified in the example form shown in Table 2. This form shall be retained by the manufacturer and by the Test Agency, and shall be available to the operator upon request to the manufacturer. Results shall be confidential to the party requesting the test and the Test Agency.

4.5.5 The SSV/USV valve being officially tested must successfully complete all steps of the performance testing procedure within the limits specified. Official verification testing cannot continue if the SSV/USV valve fails to perform within specified limits of any step, except when such failures are determined to be a result of actions by the Test Agency of a malfunction or failure within the test facility. The basis for terminating the test, and any unusual conditions observed at or prior to the time of termination, shall be noted on the test data form by the Test Agency; however the manufacturer not the Test Agency shall be responsible for determining the cause of failure.

4.5.6 If an SSV/USV valve fails to meet the requirements of this section, that SSV/USV, or any other SSV/USV valve of the same basic design and materials of construction, shall not be submitted for retest until the SSV/USV valve manufacturer has determined and documented both the need for corrective action and the corrective action taken as specified in API Specification 6A, 10.20.8. Such information need not be submitted to the Test Agency, but must be placed in the manufacturer's test file before that SSV/USV valve is submitted for retest.

Table 1—Example Application for PR2 Sandy Service SSV/USV Valve Verification Testing

Test Agency _____ Manufacturer _____
 Address _____ Representative _____
 _____ Address _____
 _____ Telephone _____
 _____ Date _____

Application for: Official Qualification Test _____ Retest _____

SSV/USV to be Tested**SSV/USV Valve Data:**

Manufacturer _____ Model or Cat. No. _____ Serial No. _____
 Size _____ Rated Working Pressure _____
 Special Considerations _____

SSV/USV Actuator Data:

Manufacturer _____ Model or Cat. No. _____ Serial No. _____
 Type: Pneumatic _____ Hydraulic _____ Other _____
 Cylinder Diameter _____ Rated Working Pressure _____
 Special Considerations _____

SPACE BELOW FOR TEST AGENCY USE ONLY

Test Schedule _____
 Month/Day/Year

Test Location _____

Applicant Notified _____ By _____
 Month/Day/Year

Table 2—Example PR2 Sandy Service SSV/USV Valve Test Form

Test Report Number _____

I. Tested SSV/USV Valve and SSV/USV Actuator Verification

	Manufacturer	Manufacturer's Contact	Model	Serial No.	Size	Working Pressure
SSV/USV Valve	_____	_____	_____	_____	_____	_____
SSV/USV Actuator	_____	_____	_____	_____	_____	_____

II. Initial SSV/USV Valve Seat Leakage Test (Refer to Section 4.6.3.) Date _____ Time _____
Test Performed By _____

1. Freshwater SSV/USV valve seat leakage test

Test Pressure _____ psi Leaked Yes _____ No _____

2. Nitrogen leakage test

Test Pressure _____ psi Leaked Yes _____ No _____

III. Sand Slurry Flow Test (Refer to Section 4.6.4.) Date _____ Time _____
Test Performed By _____

1. _____ gpm circulation rate of sand slurry.

2. _____ % by volume of 40-60 mesh frac sand in circulating sand slurry.

3. _____ seconds. Viscosity determined by Marsh funnel viscometer.

4. _____ °F (°C) slurry temperature.

5. _____ hours of sand slurry circulation.

6.a. Freshwater SSV/USV valve seat leakage test

Test Pressure _____ psi Leaked Yes _____ No _____

b. Nitrogen leakage test.

Test Pressure _____ psi Leaked Yes _____ No _____

IV. Sand Slurry Flow Test While Opening and Closing During Circulation (Refer to Section 4.6.5.)

Date _____ Time _____

Test Performed By _____

1. _____ gpm circulation rate of sand slurry.

2. _____ % by volume of 40-60 mesh frac sand in circulating sand slurry.

3. _____ sec. Viscosity determined by Marsh funnel viscometer.

4. _____ °F (°C) slurry temperature.

5. _____ psi differential pressure across SSV/USV valve when opened.

6. _____ sec. time for one complete cycle.

7. _____ number of SSV/USV cycles.

8.a. Freshwater SSV/USV valve seat leakage test.

Test Pressure _____ psi Leaked Yes _____ No _____

b. Nitrogen leakage test.

Test Pressure _____ psi Leaked Yes _____ No _____

9.a. Type and frequency of preventive maintenance. Describe in detail.

b. Number of cycles completed at last preventive maintenance operation. _____

V. SSV/USV Valve Performance Test Certification (To be completed by person performing the test or by test facility designated certifying officer.) Remarks—Note any testing problem or difficulties.

SSV/USV valve qualified for PR2 sandy service (Yes, No) _____

Certified: _____

Date: _____

4.5.7 The manufacturer shall maintain a Verification Test File on each test, including any retest that may have been required to qualify a particular SSV/USV valve design and materials of construction. This file shall be available to the operator for inspection upon request and shall be retained by the SSV/USV valve manufacturer for a period of at least ten years after SSV/USV valves of that design and materials of construction are discontinued from the manufacturer's product line. As a minimum this file shall contain sufficient documentation to identify and permit retrieval of the following:

- a. All detailed dimensional drawings and material specifications applicable to the tested SSV/USV valve at the time that particular SSV/USV valve was manufactured.
- b. All applications for official test or retest.
- c. All design and/or material modifications or other justification for retests of SSV/USV valves which did not pass any verification test.
- d. All test data specified in this specification.
- e. Model numbers and other pertinent identifying data on all other sizes and rated working pressures of SSV/USV valves of the same basic design and materials of construction that were qualified for PR2 sandy service by the verification test of this particular SSV/USV valve.

4.6 VERIFICATION TEST PROCEDURE

4.6.1 The following procedures are general and are intended to show the limits and extent of the PR2 sandy service SSV/USV valve verification test. Figure 1 summarizes the primary steps in flow diagram format. Detailed procedures are presented in 4.9.

4.6.2 The SSV/USV shall be installed in the test section of a fluid circulating system as depicted in Figures 2 and 3.

4.6.3 The SSV/USV valve shall be seat tested for pressure integrity at rated working pressure using freshwater and at 2,000 psi (13.8 MPa) using nitrogen. No leakage shall be allowed after a 3-minute stabilization period.

4.6.4 Sand slurry fluid shall be circulated through the SSV/USV valve with the SSV/USV valve in a full open position for a fifty hour period. At the end of this period the SSV/USV valve seat test of 4.6.3 shall be repeated. No leakage shall be allowed after a 3-minute stabilization period.

4.6.5 Sand slurry shall be circulated through the SSV/USV valve while cycling the SSV/USV from the fully open to the fully closed position. Differential pressure across the SSV/USV valve seat will increase to approximately 400 psi (2.8 MPa) upon each SSV/USV valve closure. Following 500 cycles of operation the SSV/USV valve seat test of 4.6.3 shall be repeated. No leakage shall

be allowed after a 3-minute stabilization period. During this phase of testing, normal preventive maintenance procedures, if any, as prescribed in the manufacturer's operating manual, shall be performed except that no preventive maintenance shall be allowed during the last 100 cycles of operation in the test. Valves shall show no visible leakage during each holding period. The test pressure reading and the time at the beginning and at the end of the pressure holding periods shall be recorded.

4.7 TEST EQUIPMENT

4.7.1 Test pressure measuring devices shall be either pressure gauges or pressure transducers.

4.7.2 Pressure measuring devices shall meet the requirements of API Spec 6A, Section 7.3.2.

4.7.3 Master pressure measuring devices shall be recalibrated with a dead weight tester in accordance with API Spec 6A, Section 7.3.2.2.

4.7.4 Dead weight testers shall be calibrated at intervals based on repeatability and degree of usage. Intervals may be lengthened and shall be shortened based on recorded calibration history provided they not exceed three months maximum until history can be established.

4.8 HEAT-SENSITIVE LOCK-OPEN DEVICES

4.8.1 Verification Testing

The manufacturer shall have data available to show that the device has been sufficiently tested to ensure that it is capable of satisfying the design requirements of API Spec 6A, Section 10.20.3.5.

4.9 PR2 SANDY SERVICE SSV/USV VALVE VERIFICATION TESTING PROCEDURE

4.9.1 Material Supplied to Test Agency by SSV/USV Valve Manufacturer

4.9.1.1 Application for PR2 sandy service SSV/USV valve verification testing, Table 2.

4.9.1.2 One hydrostatically and functionally tested SSV/USV with an appropriate operating manual.

4.9.1.3 All test section piping required for the installation of the SSV/USV in the test facility described in 4.9.2. Unless otherwise agreed by the SSV/USV valve manufacturer and the Test Agency, this shall include all special piping components necessary to install SSV/USV valves of sizes or rated working pressures other than 2 1/16 in. (52 mm), 5000 psi (34.5 MPa).

- a. The ends of the test section shall be equipped with end connections compatible with those provided by the Test Agency.

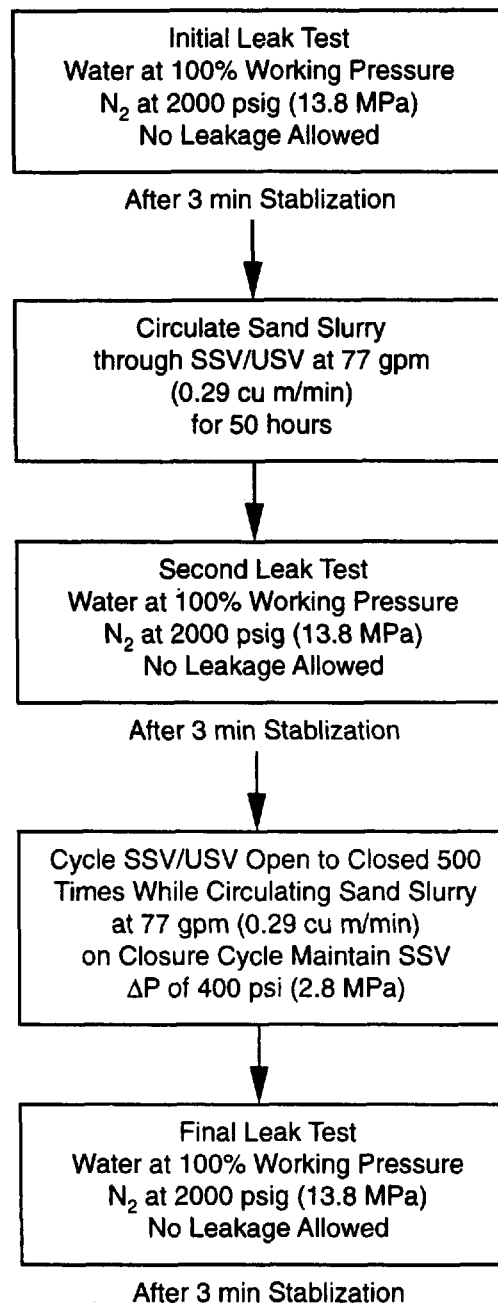


Figure 1—PR2 Sandy Service SSV/USV Verification Flow Diagram

- b. The complete removable test section with SSV/USV installed must be of a length compatible with the Test Agency's facility, as described in the Test Agency's literature.
- c. The test section shall be capable of withstanding the rated working pressure of the SSV/USV valve to be tested.

4.9.1.4 The test agency will inspect the SSV/USV and verify the identification (model and serial number) of the valve and actuator before completion of the test.

4.9.2 General Requirements for a PR2 Sandy Service SSV/USV Valve Verification Test Facility

4.9.2.1 General

The typical piping arrangement and test section detail of a test facility for PR2 Sandy Service SSV/USV Valve Verification Testing are shown in Figures 2 and 3.

4.9.2.2 Design Considerations

- a. The test facility shall be designed to permit the verification tests to be made as detailed in 4.9.3, 4.9.4, and 4.9.5.
- b. The circulation piping shall be of sufficient working pressure rating to withstand the circulation pressure. The test section upstream isolation valve and the pressure measuring devices, valves, and fittings, between it and the SSV/USV valve being tested, shall be designed for a working pressure of at least that of the valve being tested. Components of lower pressure ratings shall be protected with appropriate pressure relief valves.

4.9.2.3 Circulation System Components

- a. **Freshwater Tank.** A freshwater tank shall be provided with a minimum capacity of 5 barrels (0.8 cu m) and shall be equipped with a low level pump shutdown control.
- b. **Sand Slurry Tank and Associated Accessories.** A cylindrical, cone-bottom sand slurry tank with a minimum capacity of 5 barrels (0.8 cu m) shall be provided. The tank shall be equipped with agitation as required to obtain proper slurry consistency. Sample connections shall be provided in the tank and in the return line to the tank so that representative sand content and viscosity analysis samples may be taken. High and low level shutdowns shall be provided in the tank to signal shutdown of the circulating pumps. Viscosity and sand content shall be determined in accordance with API RP 13B and API Manual of Petroleum Measurement Standards, Chapter 10.4.
- c. **Circulating Pumps and Controls.** Circulating pumps with drivers and special equipment for pumping the sand slurry and freshwater at the required flow rates and pressures shall be installed. At least one pump shall be provided with a variable speed motor for circulation flow rate control. Each pump motor shall be provided with a nonre-

settable elapsed time meter to monitor pumping duration. The pump motors shall be equipped to shut down on high or low pump discharge pressures and a high or low tank level.

d. **Circulation Piping and Controls.** The circulation piping shall be installed in an arrangement similar to that shown in Figure 2. Block valves shall be provided as indicated in Figures 2 and 3. The return piping to the sand slurry tank shall be installed in such a manner as to provide agitation to aid in preventing sand accumulation in the bottom of the tank. A choke or other suitable means or back pressure control shall be installed between the circulation pumps and test section as shown in Figure 2, and shall be used to control SSV/USV differential pressure to 400 psi (2.8 MPa) during the cycling test (refer to 4.9.5).

e. **Circulation Flow Meter.** A circulation flow meter covering a minimum flow rate of 77 gpm (0.29 cu m/min) shall be provided. This flow meter shall provide an output signal suitable for strip chart recording.

f. **Recorders.** Recording instruments shall be provided to monitor the following data:

- Circulation flow rate during all flow testing.
- SSV/USV valve upstream test pressure during valve seat leakage test.
- Differential pressure across SSV/USV valve being tested during closure test.

Recorders shall be of appropriate ranges and equipped with variable chart speeds to allow resolution of time varying analog signals.

4.9.2.4 Utility Systems

The test facility shall be provided with the following utility systems complete with associated pumps, controls, gauges, instruments, and piping, as required to perform the tests described in 4.3 and 4.9.3 through 4.9.5 of this specification.

- a. Compressed air supply.
- b. Hydraulic oil supply.
- c. High pressure water supply.
- d. Nitrogen supply.

4.9.3 SSV/USV Valve Seat Leakage Test Procedure for PR2 Sandy Service SSV/USV Services

Record results on the form in Table 2.

Initial Leakage Tests

- Step 1: Install SSV/USV in the test section.
- Step 2: Check SSV/USV valve for leakage with freshwater.



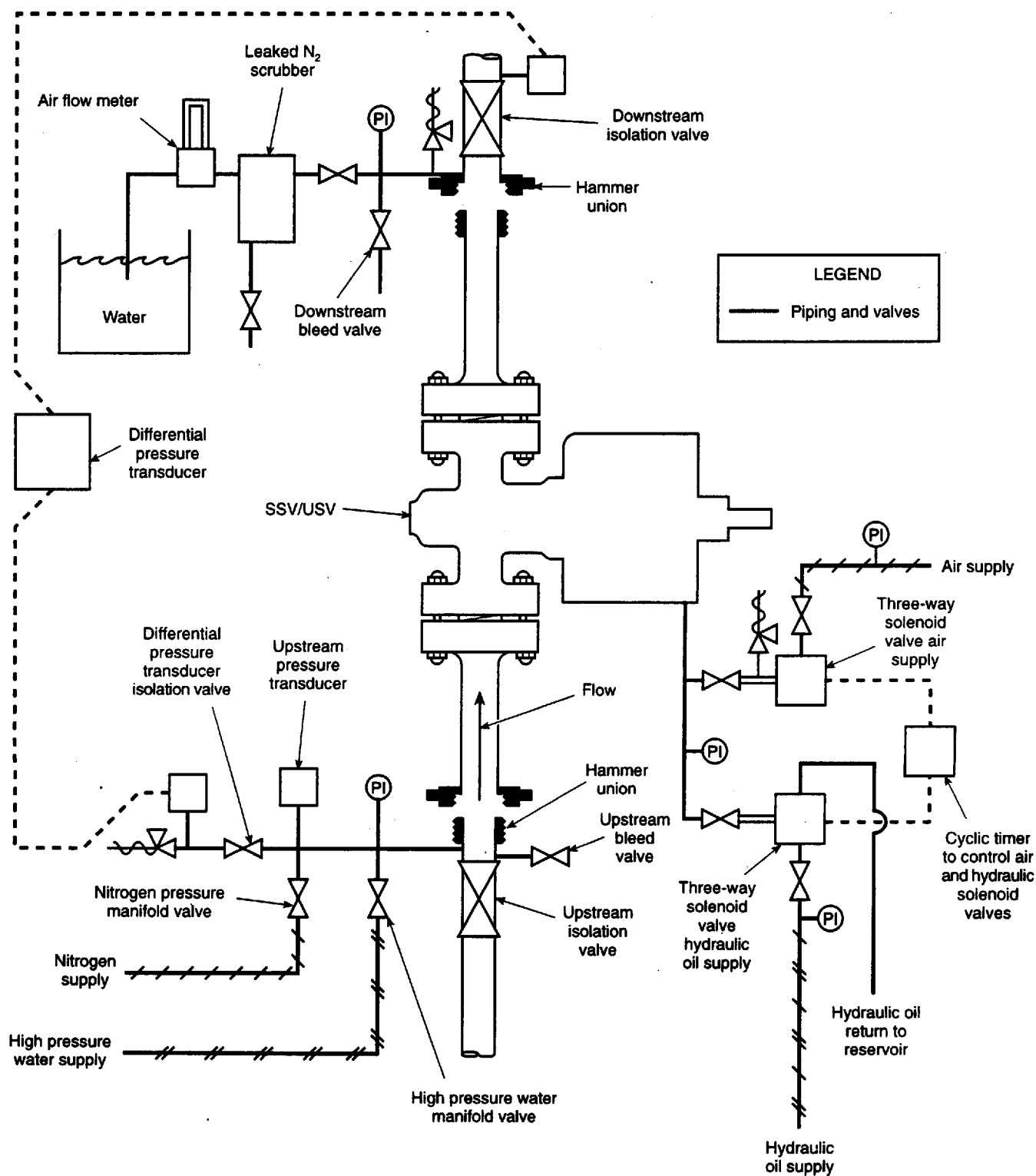


Figure 3—Example SSV/USV Valve Verification Test Section Detail

- (a) Circulate freshwater at a minimum flow rate of 77 gpm (0.29 cu m/min) for at least 10 minutes with SSV/USV valve fully open.
- (b) Close SSV/USV by releasing actuator power.
- (c) Close isolation valves upstream and downstream from SSV/USV.
- (d) Open downstream liquid leak detection valve.
- (e) Apply water pressure upstream of the SSV/USV equal to 95%–105% of the rated working pressure of the SSV/USV valve.
- (f) After the pressure has stabilized for three minutes minimum, check for SSV/USV valve seat leakage from the downstream leak detection valve for a period of five minutes minimum. No leakage is acceptable.

Step 3: Check SSV/USV valve for leakage with nitrogen pressure:

- (a) Close upstream and downstream block valves.
- (b) Bleed all pressure and drain water on both sides of SSV/USV valve. (Open and close SSV/USV valve three times while draining water.)
- (c) Close SSV/USV.
- (d) With bleed valve open, immerse the end of a flexible tube connected thereto in a container of water.
- (e) Apply 2,000 psi (13.8 MPa) $\pm 5\%$ nitrogen on upstream side of SSV/USV valve.
- (f) After the pressure has stabilized for three minutes minimum, check for valve seat leakage by observing for gas bubbles for a period of five minutes minimum. No leakage is acceptable.

4.9.4 Sand Slurry Flow Test Procedure for PR2 Sandy Service SSV/USV Valve

Record results on the form in Table 2.

First Flow Test to Check for Erosion and Fouling

Step 1: Circulate sand slurry at a minimum flow rate of 77 gpm (0.29 cu m/min) while bypassing the test section until slurry viscosity and sand content stabilize with slurry agitator on.

Step 2: Determine sand content of slurry by filling two oil gauger's 100 ml sample tubes with slurry sample and centrifuge with oil gauger's centrifuge according to API Manual of Petroleum Measurement Standards, Chapter 10.4. Adjust sand content of circulating fluid to 2% ($1\frac{1}{2}\%$ – $2\frac{1}{2}\%$ acceptable) by adding 40–60 US mesh sand or diluting mixture with freshwater.

Step 3: Determine viscosity of sand slurry sample with Marsh funnel viscometer according to API RP 13B. Adjust viscosity to 100 sec (120 sec maximum and 90 sec minimum) by adding polymer viscosifier or diluting mixture with freshwater.

Step 4: If dilution or strengthening was necessary in Step 3, return to procedure in Step 1.

Step 5: Adjust flow rate to a minimum of 77 gpm (0.29 cu m/min). Record flow rate, sand percentage, and viscosity.

Step 6: Pump sand slurry through SSV/USV valve for 25 hours (± 1 hour).

Step 7: Check sand content and viscosity or slurry as before in Steps 2 and 3. Adjust as required.

Step 8: Pump sand slurry through SSV/USV valve for an additional 25 hours (± 1 hour) at a minimum flow rate of 77 gpm (0.29 cu m/min).

Step 9: Check for leakage using procedure in 4.9.3 Steps 2(b) through 2(f).

Step 10: Check for leakage with nitrogen using the procedure in 4.9.3, Step 3.

4.9.5 Sand Slurry Flow Test While Opening and Closing during Circulation for PR2 Sandy Service SSV/USV Valve

Record results on the form in Table 2.

Flow Test

Step 1: Circulate sand slurry at a minimum flow rate of 77 gpm (0.29 cu m/min) while bypassing the test section with slurry agitator on.

Step 2: Determine sand content of slurry by filling two oil gauger's, 100 ml sample tubes with slurry samples. Centrifuge with oil gauger's centrifuge according to API Manual of Petroleum Measurement Standards, Chapter 10.4. Adjust sand content to 2% ($1\frac{1}{2}\%$ – $2\frac{1}{2}\%$ acceptable) by adding 40–60 US mesh sand or diluting mixture with freshwater.

Step 3: Determine viscosity of slurry sample with Marsh funnel viscometer according to API RP 13B. Adjust viscosity to 100 sec (120 sec maximum, 90 sec minimum) by adding polymer viscosifier or diluting mixture with freshwater.

Step 4: If dilution or strengthening was necessary in Step 3, return to procedure in Step 1.

Step 5: Adjust flow rate to a minimum of 77 gpm (0.29 cu m/min). Record sand slurry flow rate, sand percentage, and viscosity.

Step 6: Cycle SSV/USV valve from fully open to fully closed at a maximum rate of 7 cycles per minute.

Step 7: Adjust choke (or equivalent) upstream from SSV/USV valve to provide a differential pressure of 400 psi (2.8 MPa) $\pm 10\%$ across the SSV/USV valve when closed.

Step 8: Open and close SSV/USV 500 cycles (-0 , $+10$ cycles).

Step 9: Check for leakage using procedure in 4.9.3, Steps 2(b) through 2(f).

Step 10: Check for leakage with nitrogen using the procedure in 4.9.3, Step 3.

APPENDIX A—TEST AGENCY LICENSE CRITERIA

A1 Purpose

The purpose of this appendix is to provide the requirements by which laboratories may be licensed in accordance with the requirements of the definition of the Test Agency.

A2 Application and Fees

Laboratories desiring licensing under this appendix shall have a functional quality program in accordance with the ISO/IEC Guide 25-1982: General Requirements for the Technical Competence of Testing Laboratories, and API Spec Q1, Specification for Quality Programs (except: Sections 4.4, Design Control; 4.8, Traceability; 4.9, Process Control; 4.12 Acceptance Status; and 4.13.3, Field Nonconformance Reporting). API shall maintain a list of licensed laboratories, which shall appear in the API Composite List of Manufacturers Licensed for Use of the API Monogram. Laboratories desiring licensing under this appendix shall make application and pay fees as specified in A2.1 and A2.2.

A2.1 INITIAL LICENSE FEE

The applicant will be assessed an initial license fee for the first specification included in the application and a separate fee for each additional specification included in the application.

A2.2 ANNUAL LICENSE FEE

In addition to the initial license fee, laboratories will be assessed an annual renewal fee for each specification under which they are listed.

A3 Surveys

The laboratory shall submit a controlled copy of their quality assurance manual to API. The manual will be reviewed by API staff for conformance to the requirements of A2 of this appendix and specific test methods identified in this or other API specifications. Upon acceptance of the manual, API shall arrange for a survey, as specified in A3.1 and A3.2.

A3.1 INITIAL AND RENEWAL SURVEYS

First-time applicants and current licensed laboratories on every third year renewal of licensing shall be surveyed by qualified surveyors. The parameters of these surveys shall be the appropriate API specifications and the laboratory's API approved quality manual. The surveys will be performed to gather objective evidence for API's use in verifying that the laboratory is in conformance with the provisions of the Lab-

oratory Quality Program as applicable to this API specification and the requirements of A2 of this appendix. The laboratory will be invoiced for the cost of these surveys.

A3.2 PERIODIC SURVEYS

Existing laboratories will be periodically surveyed by an approved API surveyor on a nondiscriminatory basis to determine whether or not they continue to qualify as a licensed laboratory. The frequency of the periodic surveys will be at the discretion of the API staff. The costs of periodic survey will be paid by API.

A4 Removal from Licensed List

Removal of a laboratory from the licensed list shall occur due to the following:

- Failure to meet the requirements of a survey.
- Failure to pay annual renewal fee.

A5 Reinstatement of License Right

Laboratories who have been cancelled may request reinstatement at any time. If a request for reinstatement is made within sixty (60) days after cancellation, and if the reason for cancellation has been corrected, no new application is necessary. A resurvey of the laboratory's facilities will be made by an API-approved surveyor prior to a decision to reinstate license rights. The laboratory will be invoiced for this resurvey regardless of API's decision on reinstatement. If the result of the resurvey indicates to the API staff that the laboratory is qualified, the license list will be updated.

Request for reinstatement made more than sixty (60) days after cancellation shall be treated as a new application unless circumstances dictate an extension of this time period as agreed upon by the API staff.

A6 Appeals

An interested party may appeal a decision by API to withhold license rights. Appeals shall be sent the Director, API Exploration and Production Department, and handled by the General Committee of the Exploration and Production Department, with a further right of appeal to the API Management Committee. Competing suppliers of the service to which the standard applies or might apply may not be involved in appeals. The General Committee and the Management Committee may convene appeals boards to hear and act on appeals.

A7 Test Reports

Test reports completed by a licensed laboratory shall include the following:

- General information (date, location, manufacture, model, serial number, size, rating, etc.).
- Summary of test results (quantities and characteristics).
- Description of the characteristics of equipment under test.
- Observed data (including calculations and test personnel).
- Test conditions (limits required by the standard).
- Identification of test methods and procedures.
- Supporting data (log sheets, calibrations records).
- Graphic presentation (curves).
- Identification of instruments involved in the test data.
- Certification and license number.

Test reports shall be traceable to the tested equipment and shall be certified by the laboratory.

A8 Records

Unless otherwise specified in the appropriate reference standard(s), the licensed laboratory shall keep the following records for 5 years from the completion of all tests for equipment tested:

- Test data and test reports.
- Calibration.
- Nonconformance reports.
- Audit and corrective action records.
- Personnel qualification records.
- Test procedures.
- Special testing.

A9 Changes

Any changes to a licensed laboratory's approved quality assurance manual must be approved by API in writing prior to implementation.

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