

Engineering Procedure

SAEP-319

31 October, 2004

Pressure Relief Valves - Routine Test,
Inspection, Quality Assurance and Regulation

Document Responsibility: Inspection Department

Saudi Aramco DeskTop Standards

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1 Scope

- 1.1 This procedure defines the requirements for the Safety Relief Device routine testing, inspection, and maintenance program in Saudi Aramco operating facilities. The Program goal is to improve RV performance by assuring that safety relief devices will open at the specified set pressure within the tolerances set by the ASME Boiler and Pressure Vessel Code, and remain in good physical condition.
- 1.2 This procedure applies to all safety relief devices (RVs) defined in [SAEP-318](#). RVs which are on or a part of equipment owned and operated by Contractors within Saudi Aramco Operating Units shall be tested and inspected in accordance with this Procedure.

2 Definitions

All definitions of [SAES-J-600](#), [SAES-J-605](#) and [SAEP-318](#) apply, plus the following:

Relief Valve Technician: A mechanic satisfying the regulations of the Saudi Aramco Relief Valve Certification Program ([SAEP-1134](#)).

Base Interval: The interval assigned to a new valve that is derived from past experience with similar service and RV design.

Severe Service: Any service in which corrosion, plugging, sticking or similar problems are continuous or frequent.

3 References

All references defined in [SAEP-318](#), Section 4, plus the following:

3.1 Saudi Aramco References

Saudi Aramco Engineering Procedures

[SAEP-20](#)

Equipment Inspection Schedules

[SAEP-309](#)

Inspection of Community and Operations Support Facilities

[SAEP-318](#)

Pressure Relief Valve Program Authorization for RV Installation, Deletion, and Changes

[SAEP-1132](#)

Instruction for Using the Relief Valve Test Stand

[SAEP-1133](#)

Form 3750-ENG, Pressure Relieving Device Test Report

[SAEP-1134](#)

Relief Valve Technician Certification

Saudi Aramco Engineering Standards

[SAES-A-004](#)

Pressure Testing

[SAES-A-206](#)

Positive Material Identification

[SAES-B-067](#)

Safety Identification and Color-Coding

[SAES-H-101](#), [APCS-4](#)

Approved Protective Coating Systems

[SAES-J-600](#)

Pressure Relief Devices

[SAES-J-605](#)

Surge Relief Protection Systems

Saudi Aramco Materials System Specification

[26-SAMSS-062](#)

Rust Preventive

Saudi Aramco Forms

PM02

Maintenance Work Order (generated from SAP System)

SA 2760-ENG

Approval Request to Deviate from Inspection Schedule

SA 3099A-ENG

Relief Valve Authorization

Saudi Aramco Technical Alert

Alert 16

Body Pressure Relief Valve (PRV) Leakage - GROVE Ball Valves, Model B-5

3.2 Industry Codes and Standards

American Society of Mechanical Engineers

ASME SEC I

Rules for Construction of Power Boilers

ASME SEC VIII D1

Rules for Construction of Pressure Vessels

4 Test and Inspection Scheduling

- 4.1 T&I schedules for RV's are defined by the SAP Maintenance Plans. The Maintenance Plans are scheduled based on predetermined inspection intervals assigned to each RV through allocated Maintenance Packages. Section 5 of this SAEP defines how intervals are determined.
- 4.2 Test and Inspection Planned date is controlled from within the SAP system by use of the Maintenance Plan. The SAP RV Maintenance Plan controls the

automatic generation and release of the Work Order (PM02) approximately 28 days prior to the planned T&I date. The Maintenance Work Orders are scheduled automatically by SAP system and used to start the testing activity. Maintenance will download a list of outstanding Work Orders using SAP Transaction Code IW39 (Work Order List Editing), and coordinate execution of the RV T&I with the proponent organization. After completion of the RV T&I the RV test results are entered into SAP and the Usage Decision (UD) is completed, at which point the Maintenance Plan automatically indicates the next planned date.

- 4.3 Transaction ZI0069 is used to display and print the RV Overdue list for a plant. In a monthly basis, area RV Coordinator, from Inspection Unit, can produce this RV overdue list and report it to his Department Manager.

Commentary Note:

A Relief Valve appears on ZI0069 Overdue Report when it has exceeded over 30 days from the Planned Date of the call on the maintenance plan. That is due to the fact that RV was NOT tested and inspection results have not been entered in SAP in timely manner. Care must be exercised to avoid overdue RVs due to unnecessary or un-approved delays.

5 Intervals

5.1 Setting the Base Test Interval

- 5.1.1 All new RVs entered into the SAP system must have a base test interval assigned for maintenance scheduling. The Originating Engineer is responsible for designating the base interval. It is recommended that Inspection Unit and Maintenance RV Shop be consulted to review historical RV interval data for the service intended.
- 5.1.2 The following factors should be considered when determining the base test interval, and interval changes:
 - 5.1.2.1 Service conditions
 - 5.1.2.2 Type of RV
 - 5.1.2.3 Plant history
 - 5.1.2.4 Manufacturer's recommendations
 - 5.1.2.5 Industry experience
 - 5.1.2.6 Local comparable service experience

- 5.1.2.7 Usually a conservative estimate
- 5.1.2.8 Maximum Saudi ARAMCO intervals (see below)
- 5.1.2.9 Engineering evaluation
- 5.1.2.10 Plant T&I schedules dictated by [SAEP-20](#) "Equipment Inspection Schedule."

5.2 The MAXIMUM TEST INTERVAL shall be 36 months.

Exceptions:

<i>Steam Boilers</i>	<i>12 months</i>
<i>Lube oil</i>	<i>48 months</i>
<i>Instrument Air & Freon</i>	<i>60 months</i>
<i>Integral RVs in Grove Ball Valves, Model B-5</i>	
<i>Oil Service</i>	<i>96 months (Refer paragraph 5.2.3)</i>
<i>LPG/NGL Service</i>	<i>60 months (Refer paragraph 5.2.3)</i>

Surge Relief Protection Systems (SR valves):

The limit is set in Clause 10 of [SAES-J-605](#).

- 5.2.1 A RV shall, as a minimum, be shop disassembled at every third test interval for an internal inspection. Further internal inspection requirements are defined in paragraph 7.9.
- 5.2.2 See section 5.8 for Rupture Disk and Rupture Pin test intervals.
- 5.2.3 CSD issued Technical Alert 16/94 (Alert 16) which requires the integral RVs in Grove Model B-5 ball valves to be replaced at the above referenced intervals. When these intervals are reached, the SAP-generated Maintenance Report will state that the valves must be replaced. Maintenance of these valves is not allowed. The local Operations Engineer/Inspection Coordinator shall ensure that a RV Maintenance Report (previously SA 3750-ENG) is entered into the SAP system showing a test date which reflects the actual installation date of the ball valves or RV. The RV Maintenance Report data entry shall be made afterwards. Upon doing Usage Decision (UD) of RV test results the Maintenance Plan automatically indicates the next planned date to initiate the above replacement dates.

5.3 Revising T&I Intervals

- 5.3.1 Testing and inspection results shall be used to determine whether T&I intervals need to be adjusted. Intervals are revised to:
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- 1) Improve reliability.
- 2) Reduce maintenance costs.
- 3) Improve work load schedules.
- 4) Avoid over pressure incidents.
- 5) Comply with Industry recommendations.

5.3.2 Factors that may initiate revisions

- 5.3.2.1 RV condition reported during shop inspection.
- 5.3.2.2 Recurring conditions.
- 5.3.2.3 Unexpected conditions.
- 5.3.2.4 Leaking while in service.
- 5.3.2.5 Will not open at set pressure.
- 5.3.2.6 Engineering evaluation.
- 5.3.2.7 Corrosion problems - anticipated or experienced.
- 5.3.2.8 Deposit build-up.
- 5.3.2.9 Material limitations.
- 5.3.2.10 Conformance to Plant T&I schedules; or access to RV.
- 5.3.2.11 RV Program Computer generated recommendations.

5.4 The test Interval Revisions can be made based on key data in the Relief Valve Maintenance Report. Operations Engineering, using SAP Transaction ZI0112, should review and recommend interval changes as part of RV Regulating System, Section 12 of this procedure. The Interval Revisions should be reviewed quarterly by Operations Engineering, Maintenance and Inspection Unit to ensure all RVs are being tested on a safe interval or on a cost effective basis.

5.4.1 When the Relief Valve Maintenance Reports show that a relief valve has been disassembled at least once, has passed the visual inspection, pop, and reset tests, and has no part replacement for the past three (3) successive occasions, then this will result in recommending that the test interval period be increased by six (6) months. This is not applicable to boiler safety valves, however, which have a fixed test interval. The maximum test intervals increases shall not exceed the maximum intervals specified in paragraph 5.2.

- 5.4.2 From the RV Maintenance Report (previously Saudi Aramco Form SA 3750-ENG), the disassembled codes "P001", "P002", popped outside tolerance or Major Repair Work will require a review by Operations Engineering and Inspection Unit to reduce the interval. Frequent poor inspection ratings shall initiate the T&I regulating System, See Section 12 of this procedure.
- 5.4.3 A routine interval decrease can be authorized by the local Inspection Unit Supervisor and Operations Foreman after consultation with Maintenance RV Shop. An interval extension shall be authorized by the Supervisor of Operations Engineering and the Operations Superintendent.
- 5.4.4 An Authorization Saudi Aramco Form SA 3099A-ENG must be processed to update the RV interval.
- 5.5 Early or Delayed ONE TIME RV Test Schedule Changes
 - 5.5.1 For maximum maintenance efficiency, RV test schedule changes may be made without changing the Interval.
 - 5.5.2 Scheduling a RV T&I early can be approved by the local Operations Foreman by starting the next released Work Order (PM02) to initiate the work. Proceed with the T&I and reporting. The next planned due date is automatically adjusted when the Relief Valve Maintenance Report, SAP-generated Form SA 3750, is entered into SAP system and after Usage Decision (UD) is made based on the entered test result date.

Commentary Note:

Rescheduling a RV T&I requires modifying maintenance packages within a task list for the affected maintenance plan and must be rescheduled by the authorized maintenance plan processor. This method shall be pursued to avoid incorrect scheduling of a RV maintenance plan when the maintenance packages undergo changes.

- 5.5.3 A delayed T&I schedule can be approved by the local Operations Superintendent providing the delay does not exceed 3 months, or one month for each year of the specified interval, whichever is the less. Follow the usual reporting procedures. This action will still result in the RV being shown as overdue.
- 5.5.4 T&I schedule delay will exceed the limits set in paragraph 5.5.3, then Saudi Aramco Form SA 2760-ENG "Approval Request to Deviate from Inspection Schedule" shall be submitted by the Operations

Foreman or Commissioning Supervisor to the RV Administrator one month prior to the delay. The form defines the required approval signatures.

Approval of the deviation request, per paragraph 5.5.4, still results in the RV being shown as overdue. The RV Administrator enters the approved deviation interval into the SAP system. The approved interval is shown on the ZIR00790 report "Reports for Relief Valves" under the "Deviation Approved Until" column.

5.6 Intervals for RVs in Mothballed Facilities

- 5.6.1 When a RV is mothballed, the RV Database in SAP system record is to be put on an inactive status. Testing is postponed until the RV and the protected equipment is demothballed. The RV Database record in SAP system is to be activated as part of the commissioning activities. The RV should be retested during the demothballing operation and before start-up of the facility.
- 5.6.2 Use a Saudi Aramco Form SA 3099A-ENG or formal correspondence (if more than five RVs) to put RVs on a mothballing or demothballing status. Authorization is required by the Supervisor of the local Operations Inspection Unit and the Supervisor of the Operations Engineering Unit.
- 5.6.3 In SAP system, the interval will remain unchanged when the RV is mothballed. SAP system shows "MOTH" in the User Status field indicating that the RV is in mothballed status. The RV Maintenance Plan shall be inactive status "INAK" by Maintenance Division to prevent automatic scheduling of Work Order.
- 5.6.4 If the external inspection per [SAEP-20](#) of the mothballed facility finds a problem with the RV protection measures, then the RV Regulating Program, as defined in Section 12, shall be initiated to evaluate RV condition and T&I needs.
- 5.6.5 The RV Data (Record) can not be updated (changing any data) while the RV is in mothballed (inactive) status.

5.7 Intervals for "PRESSURE TEST RVs"

- 5.7.1 The test interval shall be within the following periods prior to its intended use in a pressure test, per [SAES-A-004](#), paragraph 4.10.
 - 5.7.1.1 One week for new construction projects or

- 5.7.1.2 One month for maintenance operations.
 - 5.7.2 In addition, PRESSURE TEST RVs shall have a T&I if it functions improperly. As a minimum, PRESSURE TEST RVs shall be DISASSEMBLED annually. A repair record shall be locally maintained by the RV shop for each PRESSURE TEST RV.
 - 5.8 Intervals for Rupture Disks & Rupture Pins
 - 5.8.1 Factors used to evaluate a Rupture Disk interval.
 - 5.8.1.1 Mechanical damage; flexing or installation damage.
 - 5.8.1.2 Leakage; occurring during operation.
 - 5.8.1.3 Corrosion; pitting.
 - 5.8.1.4 Creep (physical distortion of the disk or pin); replace when any distortion has occurred.
 - 5.8.1.5 Access; coincide schedule with in-series reclosing RV.
 - 5.8.1.6 Fatigue; Fine and intergranular cracks.
 - 5.8.1.7 Severe Pulsating or cyclic service.
 - 5.8.2 The Interval of a Rupture Disk and a Rupture Pin in-series or parallel service SHALL NOT EXCEED the interval of the associated reclosing RV.
 - 5.8.3 The Interval of a Rupture Disk or Rupture Pin in independent service shall be determined by its life expectancy, but shall not exceed the maximum RV interval limits set in paragraph 5.2.
 - 5.8.4 The Interval of a Rupture Disk in pulsating or cyclic service, and with an operating pressure that is more than 70% of the burst pressure shall not exceed one year.
 - 5.9 Intervals for RVs in multiple (or dual) installations and the SPARE RV in a multiple installation shall be the same. When performing the steps outlined on Charts 2, 3, & 4 "RV Test and Inspection Procedure", include the practices outlined in this section.
 - 5.10 The Interval of a Surge Relief (SR) valve shall be determined by its life expectancy but shall not exceed the maximum interval limit set in Clause 10 of [SAES-J-605](#). Change/update of SR valve interval shall follow the provision stated in paragraph 5.4.4 of this procedure.
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6 RV Removal and Handling Practices

6.1 Maintenance shall exercise CARE IN HANDLING RV's at all times that is appropriate for a delicate mechanism. Do not drop or jar, avoid stressing the RV body and parts, protect flanges and nozzles.

6.2 Store and transport RVs in the vertical position, and thoroughly secure during transport. Cover flanges, threads and nozzles with tape or special plastic plugs (available from storehouse stock) to protect the RV from dirt and mechanical damage during storage and transport.

A gag may be applied to a weighted flapper type breather valve during rough transportation to avoid damage. Retest the RV when an unusual rough transport or handling occurs. Be sure that the gag is designed so that the RV can not be installed until the gag is removed.

6.3 Operations shall verify that the RV is isolated from the process when removing a RV from in-service ACTIVE equipment by checking the following:

6.3.1 Verify block valves are closed and car-sealed (both inlet and outlet lines/connections).

6.3.2 Verify that the block valves are not passing by unscrewing the vent plug and slowly crack open the vent block valve. Vent any trapped fluid to a safe area. A blind flange is required to be installed on all flanged connections immediately after removing the RV for testing. (Refer to [SAES-J-600](#), paragraph 9.1 for safe venting locations).

6.3.3 Verify bonnet vent lines are bled and isolated.

6.3.4 Verify all pressure has been removed from the points of isolation at inlets and outlets of RVs. Verify contained liquids have been removed and drained to a safe location such as oily water sewers.

6.3.5 Verify the equipment is protected by an alternate RV of adequate capacity on the equipment or connecting equipment, and any intervening block valves are locked or car sealed open.

6.3.6 Identify the type of work permit that should be used for the job. Control or specify associated hazards and required protection on the work permit, such as high pressure, H₂S hazard, gas release and nearby sources of ignition.

7 RV Testing and Inspection Practices

- 7.1 T&I disassembly and testing shall be performed by, or under the supervision of, a Qualified and Certified RV Technician using written Shop Procedures that detail the steps involved for each type of RV serviced.
- 7.2 Each RV T&I shall be completely documented and reported by means of the SAP-generated Relief Valve Maintenance Report (previously Form SA 3750-ENG). Only one Relief Valve Maintenance Report entry shall be completed for each RV T&I. The comment section of RV Maintenance Report should be used to record detailed history of repairs.
 - 7.2.1 An approved Work Order, Form PM02, must be issued and present before a RV T&I is conducted.
 - 7.2.2 When an In-place test is conducted the Relief Valve Maintenance Report (previously Form SA 3750-ENG) shall be completed by the Technician who is doing the in-place test, and he shall forward the completed form to the responsible person for data entry within his Maintenance Organization. If the RV was repaired in the Shop prior to the In-place test, then the Shop Technician completes the initial sections of the form, and leaves the final set pressure section blank. See [SAEP-1133](#) instructions for using the Relief Valve Maintenance Report.
 - 7.2.3 The test results for a Surge Relief (SR) valve differs from other RV test results as follows:

In SAP, when the Test Operation is due the SR valve is to be tested 'In-Place' (initial set pressure test, visual inspection results and final set pressure).

When the Disassembly & Test Operation is due, the SR valve is tested In-Place for the initial test results (initial set pressure test and visual inspection results) and then tested In-Shop (initial valve shell test, initial seat leak test, reason for disassembly, visual inspection results, final valve shell test and final seat leak test). Finally, the SR valve is tested In-Place for the final test results (final set pressure test). For data entry and processing, Clauses 7.1 and 7.2 of this procedure shall apply.

Commentary Note:

THE SET PRESSURE TEST FOR SR VALVE IS DONE 'IN-PLACE' AND NEVER IN 'SHOP'. Manufacturer's recommendations and the approved test procedure (which is part of Maintenance QA Manual) shall be followed for the maintenance & testing of a Surge Relief valve.

- 7.3 RV Manufacturer's nameplate data should be documented in the RV Shop file by maintaining a facsimile or a complete record of the nameplate data. During the RV T&I verify that the nameplate is secured to the RV and is not damaged or painted.

Remember nameplates are often rendered illegible after normal field exposure. Recording this data is essential.

- 7.4 Verify that the RV tag/equipment number agrees with the Test Shop files and the body identification stamp before the testing or repairing begins. If the RV tag is missing or the RV identification can not be verified, then contact local Engineering for verification or replacement of the RV.
- 7.5 Tag and seal the RV when the T&I is complete per [SAEP-318](#) instructions. The seal shall be applied immediately upon final setting. The seal shall be a wire lock that must be broken to alter the pressure setting. Seals are available through the SAP SCM material system (Material No. 1000132164 or 1000132166).
- 7.6 Initial visual inspection shall be conducted prior to testing and/or disassembly to evaluate the overall condition of the RV. The Technician should look for corrosion, scale, obstruction, and obvious damage before attempting the "as received" POP test.
- Engineering and Inspection should be contacted immediately if problems defined in Section 12 of this procedure are found.
- 7.7 Conduct the "As Received" POP test on an adequately sized Test Stand that causes a "sharp pop" when testing a gas service RV. A simmer RV action shall not be a valid test for gas service. See [SAEP-1132](#) for Test Stand design, operation, and set pressure tolerances.
- 7.8 "As Received" LEAK TEST shall be conducted immediately after the "As Received" POP test to evaluate the RV seating surface. A leak test procedure, part of the QA Manual, shall be used. See [SAEP-1132](#) for leak testing requirements.

- 7.9 RV shop disassembly shall be required for the following conditions:

- 7.9.1 Minimally, at the third consecutive RV operating interval.
- 7.9.2 When a boiler RV fails the shop TEST, the In-place test or after two operating intervals.
- 7.9.3 When disassembly is requested by Operations, Engineering or Operations Inspection.
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- 7.9.4 After every T&I if the RV is in severe service having a history of corrosion, fouling, plugging, sticking or failures that are continuous or frequent.
 - 7.9.5 When a RV fails the "As Received" leak or pop test.
 - 7.9.6 When worn parts, corrosion or damage are observed.
 - 7.9.7 When disassembly is scheduled by SAP system, as indicated on the "Other" tab and Form SA 3099A-ENG Disassembly Indicator field. This indicator automatically requests a disassembly on the RV Maintenance Report (previously Saudi Aramco Form SA 3750-ENG).
 - 7.9.8 For mothballed RVs see [SAEP-318](#), section 13.
 - 7.9.9 New valves, prior to initial installation, to verify that internal parts meet specifications and to positively identify materials if not done by the manufacturer as per [SAES-A-206](#).
 - 7.10 RV disassembly shall include the following:
 - 7.10.1 Correct tools, QA Manual with step by step instructions, manufacturer instructions and tolerances shall be present before work begins.
 - 7.10.2 Record Critical Dimensions, details of repair, and actual steam valve ring and collar adjustments into RV Shop files.
 - 7.10.3 Replace all soft goods, such as: Gaskets, O-rings, etc.
 - 7.10.4 Clean all parts to remove all scale and expose bare metal for inspection.
 - 7.10.5 Evaluate parts with critical dimensions and critical surfaces per the RV manufacturer's specifications. Restore critical dimensions within manufacturer tolerances, and restore critical surfaces so that they are free of mechanical and corrosion damage and meet surface finishes as required by the manufacturer.
 - 7.10.6 Replacement parts shall meet manufacturer's specification. Parts shall not be fabricated by Saudi Aramco unless certified and complete manufacturer shop drawings, fabrication instructions, and material specifications are reviewed and approved by the local Engineering Unit.
 - 7.10.7 Seats and disks shall be restored using a written lapping procedure that describes lapping compounds, lap rings and lapping machine use and
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calibration. As recommended by most manufacturers, surface finish evaluation techniques that include visual or monochromatic light with optical flats, should be utilized.

- 7.10.8 Verify the correct spring is installed as specified on the Form SA 3099A-ENG. Paint the bonnet "green" on all bellow RVs as required by [SAES-B-067](#). Paint all other external surfaces and exposed springs with a coating system similar to SAES-H-101, APCS-4, which specifies aluminum color alkyd coating with primer. Painting is done either in the shop or in the field, as determined by Operation procedures. In either case, instruct the painters not to paint or damage the nameplate or foul external or internal moving parts.
 - 7.10.9 Test according to ASME SEC VIII D1 and ensure that the mating spring washers are not separated from the spring. Replace the spring if the set pressure cannot be adjusted, the spring coating is deteriorated, or cracks and/or severe corrosion are visible.
 - 7.10.10 Internals are NOT normally coated. However, a rust inhibitor such as, [26-SAMSS-062](#) Rust Proof Compound L, may be applied to internal parts. Rust inhibitors can become 'sticky', and should only be used where free movement of the relief valve internals is not impeded.
 - 7.11 Re-assembling the RV after T&I shall include:
 - 7.11.1 Verify that the reconditioned or new parts are correct and that all parts are included per manufacturer's assembly sketches.
 - 7.11.2 Bolt assemblies together using torque loads, as required by the manufacturer.
 - 7.11.3 Set the initial position of adjustable parts according to manufacturer's recommendations.
 - 7.12 RV Bellows Test
 - 7.12.1 Leak test bellows to verify that the bellows sealing joint is 100% effective and the bellows is not leaking. An approved bellows test procedure shall be included in the QA Manual. The procedure shall minimally cover the following:
 - 7.12.1.1 A test shall be conducted by pressurizing the external side of the bellows to 26 psig (138 kPa) or 25% of CDTP, Cold Differential Test Pressure (i.e., the pressure at which the RV is adjusted to open on the test stand) whichever is smaller. Over pressure can damage the bellows.
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- 7.12.1.2 Check the non-pressurized side of the bellows using a method that is sensitive to low volume flow. An apparatus similar to the seat leak test is recommended so that all possible escaping air is directed out through a tube that is submerged in water to detect bubbles.
 - 7.12.2 An in-place test procedure is acceptable providing it is prepared and approved as described in Section 10, below.
 - 7.13 RV Sealed Bonnet Leak Test
 - 7.13.1 RVs that are intended to have sealed bonnets and body joints and connected to closed discharge systems shall be tested for tightness of the bonnet and body joints to assure that NO discharge gases or liquids escape to atmosphere.
 - 7.13.2 Per an approved procedure, part of the QA Manual, a test shall be conducted by applying a 20 to 25 psig regulated air pressure to the RV body and bonnet cavity. There should be no evidence of leakage at any body joint. A soap test should be conducted to ensure the integrity of the body joints.
 - 7.14 Final Set Pressure, CDTP Test
 - 7.14.1 The final CDTP set pressure shall be conducted on an approved test bench that meets the requirements of [SAEP-1132](#), and using an approved procedure (part of the QA Manual), as defined in [SAEP-1132](#), Section 3.
 - 7.14.2 The set pressure tolerance shall conform to Table I of [SAEP-1132](#), for spring and pilot operated RVs. Tank breather and pressure/vacuum relief valve tolerances shall conform to manufacturers' guidelines.
 - 7.14.3 The cold differential set pressure, CDTP, shall be temperature compensated as required by the manufacturer temperature charts based on normal operating temperature. CDTP is not applicable to RV with open bonnet.
 - 7.14.4 The cold differential pressure shall also be adjusted to compensate for any backpressure when a valve is installed in a closed relief system.
 - 7.14.5 Pilot operated valves may be adjusted separately, however, the final test shall be with the pilot and the main valves connected and tested together.
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7.15 Final Seat Leak Test

The final seat leak test shall be conducted immediately after the final pressure setting is achieved using the procedure described in [SAEP-1132](#).

7.16 Testing and Inspection of Tank Breather RVs

7.16.1 Tank breather RVs shall be included in the RV Program, and they shall be serviced at specified intervals to assure reliable performance.

7.16.2 Tank breather valves may be tested in place using an approved procedure as required by Section 10 of this procedure. In addition to the pressure test, the procedure should include cleaning requirements, pallet weight inspection and measuring requirements, soft goods inspection, and parts replacement criteria.

7.16.3 Examples of a breather valve test bench set-up and test procedure are presented in the [SAEP-1132](#) Appendix.

7.17 Pilot Operated RV Testing

The T&I requirements are the same as spring actuated RVs. While the pilot and main body may be tested separately, the final pressure test shall be as a complete assembly. Blowdown is independently adjusted in the pilot valve, and the setting procedure shall be done as recommended in the manufacturer's maintenance manual. Refer to manufacturer maintenance manuals when disassembling and assembling pilot relief valves. Soft goods should be changed as a preventive maintenance measure. Pilot control parts have very critical dimensions and surface finishes; replacement is recommended rather than reconditioning, when they are found damaged.

7.18 RV External Inspection

After each successful T&I, an external inspection on a RV shall be conducted by Inspection Unit to ensure proper installation and identification. The required RV checklist in Attachment A of this procedure shall be used whenever a RV is tested and reinstalled. The completed RV checklist shall be kept in the Inspection Unit equipment file for each relief valve.

8 Maintenance of RVs Used for Pressure Testing

8.1 Follow identification instructions in [SAEP-318](#), Section 9.

8.2 Set pressure shall be maintained within the spring range, and the RV shall be used and maintained within the design requirements intended. Complete records shall be maintained by the RV Shop, and the PRESSURE TEST RVs shall only

be released to the field for pressure testing if it has been set within the following periods of the intended use:

8.2.1 One week for new construction projects or

8.2.2 One month for maintenance operations.

8.3 The User is responsible for returning the "PRESSURE TEST" RV to the shop.

9 Maintenance of Rupture Disks & Rupture Pins

9.1 A visual inspection is made at every scheduled T&I, as per Section 5 of this SAEP. T&I interval changes are determined by Disk and Pin condition. Replacement is required when any of the conditions of paragraph 5.8.1 are found unacceptable. Reconditioning is not permitted.

9.2 An approved procedure, part of the QA Manual, shall be used to inspect rupture disks and rupture pins, and shall minimally include: Evaluation criteria for both the rupture disk/pin and disk/pin holder assembly. Handling requirements to ensure the disk/pin remains in the disk/pin holder assembly, and controlled handling of the disk/pin. Installation requirements for bolt torque.

- A maintenance RV technician should remove or supervise the removal of a disk/pin and disk/pin holder assembly to ensure no damage occurs prior to disk/pin evaluation.
- The Local Inspection Unit shall evaluate disk/pin condition, complete the Pressure Relieving Device Maintenance Report, SAP-generated Form SA 3750-ENG and approve installation.
- Operations shall approve removal and installation.
- Local Inspection shall verify that the inlet and discharge piping is clean.
- Local Inspection shall verify that the RV number is stamped on the holder.
- Local Inspection shall verify that a pressure gauge is installed between an in-line RV and rupture disk installation.

10 In-Place Testing and Inspection

10.1 An In-place RV T&I shall be approved when it is feasible and safe to adjust a RV on line, and the RV has satisfied the disassembly requirements, as required in paragraph 7.9. An in-place test should be limited to service conditions that are clean, sweet, and non-corrosive, such as: LPG, Lube oil, steam. In-place testing shall only be permitted when a test procedure, approved per paragraph 10.4, is available.

All steam safety valves, under the jurisdiction of ASME SEC I, shall be tested in-place for final set pressure and blowdown adjustment. Also, all steam safety valves shall be tested in-place for final set pressure and blowdown whenever removed from their position for any reason.

Commentary Note:

Care must be exercised to avoid mishandling or improper transportation. RV's are often subject to mishandling during removal and/or transportation which affects their ability to lift-off at the specified set pressure and their blowdown limits.

- 10.2 The In-place testing is initiated by a Form PM02 MWO that is required to be approved by the Operating Superintendent; who writes "Approved for in-place test", and signs next to the RV.
 - 10.3 If the RV was inspected in the shop and is set in-place (this is required for boiler steam RVs) then the SAP-generated Relief Valve Maintenance Report (previously Form SA 3750-ENG) shall follow the RV into the field, and the Test Report final pressure setting shall only be reported by the RV Technician who performs the in-place test. Only one Relief Valve Maintenance Report is permitted per RV T&I.
 - 10.4 An Approved step-by-step Written Procedure is required. It shall be prepared by the local Operations Engineering Unit, and approved as follows:
 - 10.4.1 The procedure is locally approved by the Superintendent of Operations, Inspection Unit Supervisor, Operations Engineering Unit Supervisor, and the Area Loss Prevention Superintendent. Also, the procedure activity is contingent upon field witnessing by the local Operations Inspection Unit.
 - 10.4.2 The procedure is then submitted to the Manager, Inspection Department in Dhahran, for review and approval.
 - 10.4.3 Final approval is contingent upon concurrence by the General Supervisor, Process Instrumentation Division, P&CSD.
 - 10.5 The procedure shall have provisions for:
 - 10.5.1 Demonstrating full lift, and accuracy of adjustments.
 - 10.5.2 Leakage testing instructions and criteria. The manufacturer's test procedure is adequate for boiler steam valves as long as the requirements of ASME are met.
 - 10.5.3 Clearly defined responsibilities.
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- 10.5.4 Personnel safety precautions such as hearing protection, discharge considerations, and other precautions determined to be necessary.
- 10.5.5 Isolation of the RVs and vessel pressure control during the test shall be well defined.
- 10.5.6 Provisions and criteria for shop test and/or repair shall be made if the In-Place test or adjustments are not successful.
- 10.5.7 Description of the necessary tools and equipment that must be present before the test begins.

11 Quality Assurance Manual

- 11.1 All Saudi ARAMCO RV Maintenance Test Facilities shall have a Quality Assurance Manual prepared by the Shop, and approved by the Maintenance Manager and the local Inspection Unit Supervisor. This manual shall contain procedures that address and provide for control of all activities and requirements relating to inspection and testing of RVs. The QA Manual shall be reviewed and revised, as necessary, at an interval determined in the QA Manual.
- 11.2 The QA Manual is a written record of the detailed work procedures used to repair and test RVs. The purpose of the Manual is to have a central reference source that describes or references the shop work methods, repair procedures, testing procedures, responsibilities, procedure revision, and personnel qualifications. The Manual shall assure that quality maintenance standards will be continuous even with personnel turnover.
- 11.3 See the Appendix, QA Outline, for QA Manual required text.

12 RV Test & Inspection (T&I) Regulating System

- 12.1 The T&I Regulating System is a mandatory method of generating recommendations through consultation and analysis between Engineering, Inspection Unit and Maintenance. The purpose is to improve the reliability of the relief valve program in Saudi Aramco. The Regulating system may be initiated as a result of:
 - 12.1.1 Pressure setting changes while operating.
 - 12.1.2 RV may not be opening completely.
 - 12.1.3 Design is incorrect for service conditions, i.e., metallurgy, sizing, inlet/outlet piping, etc.

- 12.1.4 Excessive corrosion is causing performance failure.
 - 12.1.5 RV inlet or outlet is damaged.
 - 12.1.6 More than two Relief Valve Maintenance Reports, Form SA 3750-ENG, that indicate major repair, stuck, severe corrosion attack, or severe plugging conditions.
 - 12.1.7 Parts are abnormally worn.
 - 12.1.8 Abnormal damage to bellows or other parts.
 - 12.1.9 The interval continually remains less than one year.
 - 12.1.10 Frequent recurring problem(s).
 - 12.1.11 Stuck (Valve does not open at a pressure greater than 10% of the set pressure).
 - 12.1.12 Replacement parts are not available.
 - 12.1.13 Critical dimensions are unknown, and unavailable.
 - 12.1.14 Fouling.
 - 12.1.15 Does not close while in operation.
 - 12.1.16 Mothballed plant audit indicates failed protection.
 - 12.1.17 General Alert Report initiated from another source.
 - 12.1.18 Inspection or Engineering observations.
 - 12.2 One of the above conditions shall cause the RV Technician to contact the RV Shop Foreman, or equivalent position, who will report the problem to the Operations Engineering Supervisor. The Engineer assigned to the investigation consults with Inspection Unit, Maintenance staff, and Operators. Depending on the investigation needs, an Inspector, RV Technician, and/or Operator shall be requested by the Engineer through their Supervision to assist in finding the causes and develop recommendations to correct the problem. Where other RVs within a system are also affected, consideration should be given to involving Loss Prevention in the investigation.
 - 12.3 The Engineer shall generate a final report that defines the RV condition, the cause of the condition, and the corrective action recommended. The report is to be submitted to the Operations Foreman for approval. The Engineer shall update the Test Interval, if required. Maintenance shall make the recommended
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repairs upon approval by the Operations Foreman. Recommendations should include measures that will prevent any similar future problems.

- 12.4 Required work to correct the condition shall be initiated on a Maintenance Work Order approved by the Operations Superintendent. Engineering and Inspection shall verify the work is completed and documented in the RV Coordinator's files.
- 12.5 A copy of the report shall be sent to the RV Administrator who will distribute it to other Saudi Aramco Operating Units with similar RV applications.

13 RV T&I Audit Program

- 13.1 An audit of every RV T&I Program shall be conducted a minimum of once every year by the associated local Inspection Unit. This includes RV facilities within the local Operation's support facilities, per [SAEP-309](#). The Operations Inspection Division (OID), Dhahran, will assist Inspection Units in conducting a RV T&I Program audit, upon request.
- 13.2 The audit shall determine if the RV T&I Program conforms to the requirements of the RV SAEPS, has adequate information and equipment to perform the work, implements the Quality Assurance Manual procedures, maintains adequate records and parts inventory, participates in the Regulating System, and provides active training for the RV technicians.
- 13.3 The local Inspection Unit shall publish the audit findings and recommendations and track them quarterly to completion. A copy of the findings and recommendations shall be forwarded to the Manager of the Inspection Department.
- 13.4 For assistance in preparing an audit questionnaire or conducting an audit, contact the Operations Inspection Division of the Inspection Department.

QA Outline – Maintenance Quality Assurance Document

Each Maintenance RV Shop shall prepare a Quality Assurance Manual. The contents of the manual shall include:

Title Page:

Show name of test shop.

Purpose Statement:

1. Describe the quality assurance system and purpose of the manual.
2. You may quote Chart 1, with any additional provisions applied within the shop.

Revision log:

1. Issuing Date and authorization
2. Update dates, approvals
3. Log of changes in this section.
4. Distribution of Manual

Contents Page:

1. List contents.

Authority and Responsibility:

1. Indicate title of person with authority and responsibility for discharging the duties outlined in this document.

Organization:

1. Show organization chart for staff involved in assuring the quality of testing and repairing functions.
2. You may complete this section by referring to Chart 1 and adding any provisions deemed necessary by the maintenance unit.
3. The chart shall show the titles of the Shop Supervisor, the RV Technicians, the machinists and any other staff directly involved in assuring the quality of testing and repair.

Scope of Work:

1. Indicate scope and type of work
2. Type and size of Relief Valve
3. Test media
4. Pressure range
5. Volume capacity of the test bench

Terms and Definitions

Include the definitions and terms referred to in the testing of RVs which a RV Technician would normally use in his day to day work. Refer to [SAEP-318](#).

Document Control:

1. Indicate the way you ensure that the latest manuals and drawings are used for repair, testing and inspection.
2. Indicate the interval for revision of the QA Manual.

Parts Control:

1. Describe how parts are purchased and received.
2. Describe the control features used to ensure that RVs received are identified, stored, maintained and how lost, damaged, or otherwise nonconforming RVs are reported.

Repair and Inspection:

1. Show a checklist of procedures/instructions
2. Develop a procedure to describe and control how contaminated RVs are neutralized, drained, or cleaned. Also describe the tagging method of hazardous contaminated RVs. Examples of contaminated RVs are those in acid, caustic, and H₂S service.
3. Methods of controlling repairs, replacement and storage of spare parts.
4. Establish repair flow sheet (use the flow sheets provided in SAEP-319 as an example) to show the general repair procedure for different type of RVs (spring loaded, pilot, rupture disk, etc.). Use the JSTC Training program to detail the steps for inspection and testing spring type RVs.

Manufacturer's service manuals are to be included here. Be sure to include a service manual for each RV type and manufacturer.

5. Add further particulars where necessary or helpful.

RV Testing and Setting:

1. Indicate how you ensure that every valve is tested, set and sealed.
2. Write a detailed RV bellow, bonnet and seat leak test procedure. The procedure should explain how each type of leak test is performed for each type of RV used within the operating area.
3. Use the [SAEP-1132](#) for the pressure tolerance that are permitted for pressure testing and leak testing. Most of these procedures can be copied from the RV SAEP with only minor additions to custom fit to your facility.
4. Add any further provisions you consider necessary.

Tagging:

1. Describe tagging requirements.
2. Refer to Charts 2-4 and the SAEP.

Calibration of Measurements and Test Gauges:

1. Write a calibration procedure for the test pressure gauges. Describe how you schedule gauges and digital instruments for calibration, what the time periods between calibrations are, and how you verify that no measuring equipment is used unless it is calibrated.

Include a history log of calibration where all gauges are numbered and tagged which will make it easy to trace any gauge.

2. The title of the authorized person carrying out the calibrations.
3. Describe calibration stickers/seals that are attached to gauges.

Lapping:

1. Recognize that lapping is a specialized function, and provide the necessary special tools and describe their functions (example: Optical comparators for checking seat flatness, Measuring Magnifier, Straight Edge).
2. Prepare a more detailed lapping procedure than those shown in the manufacturer's services manuals, if possible. Describe which type of lapping compounds and blocks are used when lapping a disk and seat (with or without an angle). Note any

special lapping problems that the Machinist should expect to run into and how to resolve them.

3. Describe how to make sure that all lapping equipment is inventoried, functional, clean, and complete. (This may be best achieved by assigning this responsibility to a RV technician).

Records:

1. Describe records system, i.e., initiation, identification, filing, maintenance and retention of all RV records.

Recruitment and Training:

1. Outline the job entry qualifications in terms of the academic and industrial background of the technicians and machinists.
2. Indicate the training program for the staff involved in assuring the quality of testing and repair of RVs.
3. Indicate the type and frequency of the training.
4. Outline the job entry qualifications in terms of the academic and industrial background of the test conductor per [SAEP-1134](#).

31 October, 2004

Revision Summary
Major revision.

Chart I – Testing and Inspection Responsibilities

RV Administrator

1. Reviews and approves 3099A-ENG. Verifies RV number against SAP system.
2. Troubleshoots reporting and data entry problems for RV's in SAP system.
3. Provides assistance to users on how to complete the 3099A-ENG form.

Operations Engineering

1. Enters RV design and/or changes into the RV database through SAP system.
2. Initiates and authorizes 3099A-ENG design data.
3. Obtains RV number from Maintenance through SAP system.

Local RV Coordinator

1. Reviews & signs off 3750-ENG received from Maintenance. Verifies results against 3099A-ENG form.
2. Approves test data input by Maintenance into the RV database through SAP system.
3. Investigates overdue RV's and records that do not match field data.
4. Troubleshoots reporting and data entry problems for RV's in SAP system.
5. Provides report data for distribution of user requested reports.
6. Reviews and initials 3099A-ENG form.

Operations: Foreman / Superintendent

1. Approves Preventive Maintenance Order (PM02) for RV T&I through SAP system.
2. Prepares and approves field generated RV T&I Work Order PM07, as required.
3. Approves IN-PLACE Testing by signing and writing "approved for in-place testing" next to the RV listed on the Shop Paper (Job Ticket) of PM02 Work Order.
4. Approves the Maintenance request through SAP mail to execute IN-PLACE Testing.
5. Shall assure every installed RV is field checked for:
 - a. Installation is complete.
 - b. Tagged, sealed properly and transportation gag is removed.
 - c. RV's bonnet with bellows are painted green.
 - d. Block valves are painted orange.
 - e. Block valves are adjusted for operation and chained/car-sealed/locked.
 - f. Vents on bellows RV's are opened or piped to a safe location.
 - g. Block valve and vent valve stems are oriented horizontally or sloping down away from the valve, per SAES-J-600.
 - h. Operable pressure gauge is present for in-line rupture disk.
 - i. Physical survey on installed RV's conducted every two years, per SAEP-318.
6. Signs off the Verification section on 3099A-ENG form right after RV installation, per SAEP-1131.
7. Authorizes changes or new RV installations through 3099A-ENG form.

Maintenance or MSSD Shops: RV Technician, Shop Foreman, Superintendent

1. Handle and transport RV's carefully. Maintain RV at vertical position at all times. Verify against 3099A-ENG information.
2. Using the instructions provided in the QA Manual, make initial visual inspection of the RV inlet and outlet for corrosion, clogging, indications of leakage, mechanical damage, wear, body damage, external corrosion, etc.
3. Using an approved IN-PLACE testing procedure, per SAEP-319.
4. Using an approved test stand (per SAEP-1132), perform the initial pop and leak tests per SAEP-319, perform all applicable tests, in shop or in-place, per SAEP-1133.
5. Record all results on the 3750-ENG form and enter test data in RV database through SAP system.
6. Send original 3750-ENG form to local RV Coordinator for test results approval.
7. Disassemble RV when interval requires it, when RV fails initial testing, or when requested by Operations or Engineering.
8. Retest the RV for performance, leakage and adjusting, as described in step 4.
9. Leak test RV bellows and closed bonnet, where applicable, using minimum acceptance criteria in SAEP-319.
10. Apply the adjustment seals upon completion of the T&I (overhaul)
11. Affix metal tag and seal properly per SAEP-318.
12. Transport the RV to field and handle as described in step 1.
13. Maintain a history file comprises of 3099A-ENG, 3750, ISS, SIS, P&ID's and RV related correspondence.

Contractor

1. Contractor shops shall follow all steps according to SAEP-318 & SAEP-319 including the QA Manual.
2. Contractor shops shall complete the 3750-ENG form and return to the maintenance originator.
3. The maintenance originator is responsible for 3750-ENG data entry into the RV database, using SAP system.
4. The test results shall be reviewed and approved by the assigned local RV Coordinator.

Chart II – Spring Loaded RV Testing Inspection

Visual Inspection

1. Verify the RV identification by comparing the tag and nameplate against the database description.
2. Begin recording T&I data on 3750-ENG form.
3. Examine RV visually per manufacturer's manual and shop QA manual, looking for corrosion, scale, debris, clogging, mechanical damage.
4. Conduct initial "As Received" pop and leak tests to determine if RV is operational.
5. Disassembly is required if either tests fails, if it is third interval or as defined in QA manual or SAEP-319.
6. If RV is not to be disassembled, and it passes all tests, go to TEST TAG SEAL.

Disassembly

1. Disassemble RV per manufacturer's instructions or QA manual's procedures.
2. Control all parts to ensure they are not mixed or lost.
3. Record obvious corrosion or damage on 3750-ENG form as the RV is disassembled.
4. Immediately contact Engineering and Inspection for further evaluation before cleaning, if unexpected damage or corrosion is found.

Inspection

1. Inspect all parts per manufacturer's manual and QA manual procedures.
2. Request NDE examination by Inspection where required for crack detection or wall thickness measurements.
3. Check critical surfaces and dimensions.
4. Check for wear, corrosion, free movement mechanical damage, bent or cracked parts.
5. Check spindle and spring for straightness.
6. Evaluate the capability of parts to be reconditioned.
7. Record findings on 3750-ENG report form.

Cleaning

1. Clean all parts to bare metal for further detailed inspection
2. Body and other 'rough surface' parts can be abrasively cleaned, as limited by manufacturer's instructions.
3. Protect the nameplate from damage.
4. Critical dimension parts and surfaces shall be cleaned with methods that do not cause damage to the surface finishes and contours.

Repairs

1. Restore parts within manufacturer's tolerances.
2. Lap metal seating surfaces and replace soft seats as defined in manufacturer's manual.
3. Use tools adequate for the work intended.
4. Evaluate parts with suitable measurement instruments.
5. Replace parts that do not meet manufacturer's requirements, and all soft goods.
6. Replacement shall be manufacturer supplied or made from approved materials per manufacturer's drawings.
7. All external surfaces shall be cleaned to bare metal and coated.
8. Paint bonnets of bellow RVs green.

Test Tag Seal

1. Adjust to obtain the correct opening pressure (pop).
2. The RV repair is accepted or rejected by the valve function within the pressure test tolerances in SAEP-319.
3. Apply the wire seal to the RV adjustment screws so that the seal must be broken to change the adjustments.
4. Attach the identification tag with the RV number, T&I date, next T&I date, and test pressure to the RV.

Chart III – Pilot RV Testing and Inspection

Visual Inspection

1. Verify the RV identification by comparing the tag and nameplate against the database description.
2. Begin recording T&I data on 3750-ENG form.
3. Examine RV visually per manufacturer's manual and shop QA manual, looking for corrosion, scale, debris, clogging, & mechanical damage.
4. Conduct initial "As Received" pop and leak tests to determine if RV is operational.
5. Disassembly is required if either tests fails, if it is third interval or as defined in QA manual or SAEP-319.
6. If RV is not to be disassembled, and it passes all tests, go to TEST TAG SEAL.

Disassembly

1. Disassemble RV per manufacturer's instruction or QA manual's procedures.
2. Control all parts to ensure they are not mixed or lost.
3. Record obvious corrosion or damage on 3750-ENG form as the RV is disassembled.
4. Immediately contact Engineering and Inspection for further evaluation before cleaning, if unexpected damage or corrosion is found.
5. Check pilot tube for plugging, the pilot pistons for sticking, and main valve piston for sticking.

Cleaning

1. Clean all parts to bare metal for further detailed inspection.
2. Body and other 'rough surface' parts can be abrasively cleaned, as limited by manufacturer's instructions.
3. Protect the nameplate from damage.
4. Critical dimension parts and surfaces shall be cleaned with methods that do not cause damage to the surface finishes and contours.
5. Verify that all pilot control cavities and orifice surfaces are clean.

Inspection

1. Inspect all parts per manufacturer's manual and QA manual procedures.
2. Request NDE examination by Inspection where required for crack detection or wall thickness measurements.
3. Check condition of all soft goods.
4. Evaluate seating and moving part surfaces to determine if repair or replacement is required.
5. Check all orifices, passages, and critical dimensions.
6. Evaluate the capability of parts to be reconditioned.
7. Record findings on 3750-ENG report form.

Test Tag Seal

1. Adjust to obtain the correct opening pressure with pilot. Then test the pilot and main valve together.
2. The RV repair is accepted or rejected by the valve function within the pressure test tolerances in SAEP-319.
3. Apply the wire seal to the RV adjustment screws so that the seal must be broken to change the adjustments.
4. Attach the identification tag with the RV number, T&I date, next T&I date, and test pressure to the RV. Both the pilot and main valve shall be tagged if they are mounted separately.

Repairs

1. Restore parts within manufacturer's tolerances.
2. Lap metal seating surfaces and replace soft seats as defined in manufacturer's manual.
3. Use tools adequate for the work intended.
4. Evaluate parts with suitable measurement instruments.
5. Replace all soft goods and pilot control parts that are worn, corroded and do not meet manufacturer's requirements.
6. Replace pilot tubing if damaged.
7. Replacement shall be manufacturer supplied or made from approved materials per manufacturer's drawings.
8. All external surfaces shall be cleaned to bare metal and coated.

Chart IV – Tank Breather Valve Testing and Inspection

Visual Inspection

1. Verify the RV identification by comparing the tag and nameplate against the database description.
2. Begin recording T&I data on 3750-ENG form.
3. Examine RV visually per manufacturer's manual and shop QA manual. Remove the cover, screen and pallet, looking for corrosion, scale, debris, clogging of screen, mechanical damage and free movement of parts.
4. Conduct initial "As Received" pop and leak tests to determine if RV is operational.
5. Disassembly is required if either tests fails, if it is third interval or as defined in QA manual or SAEP-319.
6. If RV is not to be disassembled, and it passes all tests, go to TEST TAG SEAL.

Disassembly

1. Disassemble RV per manufacturer's instructions or QA manual's procedures.
2. Control all parts to ensure they are not mixed or lost.
3. Record obvious corrosion or damage on 3750-ENG form as the RV is disassembled.
4. Immediately contact Engineering and Inspection for fither evaluation before cleaning, if unexpected damage or corrosion is found.

Cleaning

1. Clean all parts to bare metal for further detailed inspection.
2. Body and other 'rough surface' parts can be abrasively cleaned, as limited by manufacturer's instructions.
3. Protect the nameplate from damage.
4. Critical dimension parts and surfaces shall be cleaned with methods that do not cause damage to the surface finishes and contours.
5. Remove all soft goods and clean for inspection.

Inspection

1. Inspect all parts per manufacturer's manual and QA manual procedures.
2. Request NDE examination by Inspection where required for crack detection or wall thickness measurements.
3. Check condition of all soft goods.
4. Evaluate seating and moving part surfaces to determine if repair or replacement is required.
5. Record findings on 3750-ENG report form.

Test Tag Seal

1. Adjust to obtain the correct opening (pop).
2. The RV repair is accepted or rejected by the valve function within the pressure test tolerances in SAEP-319.
3. Apply the wire seal to the RV adjustment screws so that the seal must be broken to change the adjustments.
4. Attach the identification tag with the RV number, T&I date, next T&I date, and test pressure to the RV.

Repairs

1. Restore parts within manufacturer's tolerances.
2. Lap metal seating surfaces in their assembled position using a reconditioned flat ring or glass. Replace soft seats as recommended in manufacturer's repair manual, and assure that the soft goods are lying smoothly.
3. Use tools adequate for the work intended.
4. Evaluate parts with suitable measurement instruments.
5. Replace parts that do not meet manufacturer's requirements.
6. Replacement shall be manufacturer supplied or made from approved materials per manufacturer's drawings.
7. All external surfaces shall be cleaned to bare metal and coated.

Attachment A – RV Checklist for External Inspection

Click the following link to display the blank form:

- Double click here => [AEP319A](#) to view [RV Checklist for External Inspection](#).