PSV-RW-3 Check Valve-Vacuum Breaker Functional Check at 242-A Evaporator

USQ # EV-17-0966-S, Rev 0

CHANGE HISTORY (≤ LAST 5 REV-MODS)

<table>
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<td>B-2</td>
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<td>Engineering Change</td>
<td>QAT Signature for Data Verification and Records Section Change.</td>
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<td>B-1</td>
<td>09/02/2015</td>
<td>Maintenance Request</td>
<td>Changed the signature from QAT to FWS/Technician At steps 5.1.22, 5.1.24, 5.1.26, 5.2.4, 5.2.10, 5.2.14.</td>
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<td>A-2</td>
<td>09/12/2013</td>
<td>Engineering Request due to vacuum bleed off.</td>
<td>Struck Section 3.3, Caution prior to step 5.2.1, 5.2.8, 5.2.9. Reword Steps 5.2.1, 5.2.6, 5.2.7. Add Note prior to Step 5.2.6. Note prior to Step 5.2.10 and added Step 5.2.12.</td>
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1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides instructions for functionally testing the safety-significant PSV-RW-3 to verify the check valve/vacuum breaker is operable.

This procedure complies with in-service inspection/test 6.2.1 of HNF-15279. Failure to comply with this test in accordance with the specified frequency would result in a TSR violation when the 242-A Evaporator is in the Operations Mode Scope.

1.2 Scope

This procedure may only be performed when the 242-A Evaporator is in the “SHUTDOWN” mode.

This functional test demonstrates operability of the PSV-RW-3 check valve/vacuum breaker:

- To prevent backflow of waste into the raw water system. Preventing the backflow of waste into the raw water system protects facility workers from a flammable gas accident (i.e., accumulation of flammable gas generated by waste in the raw water system piping or components)

- To limit the waste into the raw water system in a non-radiologically controlled area. Limiting the backflow of waste into the raw water system in a non-radiologically controlled area protects facility workers from chemical burns due to a wetting spray/jet/stream leak.
2.0 INFORMATION

2.1 General Information

2.1.1 The raw water line containing PSV-RW-3 is located on the fifth floor of the 242-A Condenser Room. Among other purposes, this water line supplies water to the C-A-1 vessel dip tubes and for dump valve and slurry valve flush lines. For the C-A-1 Vessel dip tubes, there is a total rise of 23’ 6” from the top of the waste surface in the C-A-1 Vessel to the highest point of the dip tube line. Since a vacuum break requires a 34’ rise (for water), it is possible for waste to be siphoned from the C-A-1 vessel through the dip tube lines and the water line into the raw water system. Similar scenarios for siphoning waste into the raw water line exist for the dump valve and slurry flush lines. A backflow of waste can occur at a vacuum of approximately 8 psi differential pressure (approximately 16 inches Hg).

2.1.2 PSV-RW-3 is a 2” wafer-insert check valve with a spring that cracks open at approximately 0.5 psig (approximately 1.0 inches Hg vacuum).

2.1.3 Functionally testing the PSV-RW-3 check valve/vacuum breaker will be performed to verify it opens at \( \leq 3.0 \) psi (\( \leq 6.0 \) in. Hg).

2.1.4 Information only gauges PI-1A and PI-1B are for indication only and do not require calibration.
3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

Refer to TF-PLN-86 for 242-A Evaporator facility specific hazards.

3.2 Radiation and Contamination Control

Work in radiological areas will be performed using a Radiological Work Permit (RWP) following review by Radiological Control per the ALARA Work Planning procedure TFC-ESHQ-RP_RWP-C-03.
4.0 PREREQUISITES

4.1 Special Tools, Equipment and Supplies

The following supplies may be needed to perform this procedure:
- Calibrated vacuum gauges
  - Primary gauge PI-2: Heise 0 to 30 psia
  - Secondary gauge PI-1: 0 to 30” Hg vacuum analog gauge
- Vacuum Pump
- Leak Check Vacuum Test Assembly
- Hand Tools, (screwdrivers, wrenches)
- Other tools, equipment and supplies as identified by Shift Manager/OE/FWS/User.

4.2 Field Preparations

4.2.1 NOTIFY Operations Supervisor of the pending disruption of water service on the line protected by the PSV-RW-3 Check Valve/Vacuum Breaker during the performance of this procedure.

NOTE - The M&TE primary gauge PI-2 will be installed on raw water isolation valve 5-28A. The M&TE secondary gauge PI-1 will be installed between the 10 liter vacuum reservoir and vacuum regulating valve VRV-2.

- The primary vacuum gauge (PI-2) will be used to verify operation of the PSV-RW-3 check valve/vacuum breaker. The secondary vacuum gauge (PI-1) will be used to verify the “Leak Check Vacuum Test Assembly” is free from leaks.
- The vacuum gauges associated with VRV-1 and VRV-2 are not M&TE and are used for convenience only.

4.2.2 VERIFY the vacuum gauges calibrations are current:

Primary Gauge (PI-2): ____________________________  ________________
M&TE#                  Calibration Date

Secondary Gauge (PI-1): ____________________________  ________________
M&TE#                  Calibration Date

________________________/________________________/______________
Technician Signature      Print (First & Last)      Date

________________________/________________________/______________
WRPS QAT Signature        Print (First & Last)      Date
PSV-RW-3 Check Valve-Vacuum Breaker Functional Check at 242-A Evaporator

5.0 PROCEDURE

5.1 Setup Leak Check Vacuum Test Assembly

**Isolate PSV-RW-3 From Raw Water System/Drain Line**

5.1.1 CLOSE valve 5-32.

5.1.2 CLOSE valve 5-33.

5.1.3 CONNECT a drain line hose and container to Valve 5-28.

5.1.4 SLOWLY OPEN valve 5-28 to drain water/relieve pressure from line AND

    WHEN water begins draining, SLOWLY OPEN valve 5-28A to allow air inflow to the pipe.

5.1.5 WHEN draining is complete, CLOSE valve 5-28 AND

    REMOVE drain line/hose installed in Step 5.1.3.

5.1.6 POUR raw water into nearest floor drain.

5.1.7 INSTALL M&TE vacuum gauge PI-2 on valve 5-28A.

**Prepare/Leak Check Vacuum Test Assembly**

5.1.8 INSTALL M&TE Secondary Vacuum Gauge PI-1 on “Leak Check Vacuum Test Assembly” in accordance with Figure 2.

5.1.9 NOTIFY WRPS QAT coverage is required for data verification.

5.1.10 VERIFY “Leak Check Vacuum Test Assembly” is per Figure 2.

\[
\begin{array}{ccc}
\text{FWS Signature} & \text{Print (First & Last)} & \text{Date} \\
\end{array}
\]

\[
\begin{array}{ccc}
\text{WRPS QAT Signature} & \text{Print (First & Last)} & \text{Date} \\
\end{array}
\]

5.1.11 ENSURE M&TE vacuum gauge PI-1 located on “Leak Check Vacuum Test Assembly” reads approximately 0 in Hg vacuum.

5.1.12 ENSURE valve 5-28 on the raw water line is closed (see Figure 1).

5.1.13 CONNECT “Leak Check Vacuum Test Assembly” as shown in Figure 2 to valve 5-28 on “PSV-RW-3 Check Valve/Vacuum Breaker” and Raw Water Line Figure 1.
5.1 Setup Leak Check Vacuum Test Assembly (Cont.)

5.1.14 **ENSURE** “Leak Check Vacuum Test Assembly” isolation valve V2 is open.

5.1.15 **ENSURE** “Leak Check Vacuum Test Assembly” isolation valve V1 is open.

5.1.16 **ENSURE** “Leak Check Vacuum Test Assembly” isolation valve V3 is open.

5.1.17 **START** vacuum pump.

**NOTE** - Gauges PI-1A and PI-1B are for indication only and do not require calibration.

5.1.18 **ADJUST** VRV-1 to evacuate vacuum reservoir to between 18 and 25 in. Hg (as read on VRV-1 vacuum gauge PI-1A).

5.1.19 **ADJUST** VRV-2 to evacuate section of “Leak Check Vacuum Test Assembly” (between VRV-2 and connection at valve 5-28) to between 18 and 25 in. Hg (as read directly from VRV-2 vacuum gauge PI-1B).

5.1.20 **WHEN** desired vacuum of between 18 and 25 in. Hg is achieved, **CLOSE** “Leak Check Vacuum Test Assembly” isolation valve V1.

5.1.21 **STOP** “Leak Check Vacuum Test Assembly” vacuum pump.

5.1.22 **RECORD** starting vacuum from M&TE vacuum gauge PI-1 (located between vacuum reservoir and vacuum regulating valve VRV-2).

Starting vacuum: _____________ in. Hg.

FWS/Technician Signature / Print (First & Last) / Date

5.1.23 **OBSERVE** “Leak Check Vacuum Test Assembly” for leaks/loss of vacuum for 3 minutes.

5.1.24 **RECORD** ending vacuum from M&TE vacuum gauge PI-1 (located between vacuum reservoir and vacuum regulating valve VRV-2).

Ending vacuum: _____________ in. Hg.

FWS/Technician Signature / Print (First & Last) / Date
5.1 Setup Leak Check Vacuum Test Assembly (Cont.)

5.1.25 **RECORD** vacuum loss: Starting Vac. – Ending Vac. = ________ in. Hg.

5.1.26 **VERIFY** the vacuum loss does not exceed 1.0 in. Hg.

_________________________ / __________________________ / ________________
FWS/Technician Signature       Print (First & Last)               Date

_________________________ / __________________________ / ________________
WRPS QAT Signature            Print (First & Last)               Date

5.1.27 **IF** the “Leak Check Vacuum Test Assembly” fails leak check, **TIGHTEN** connections and re-perform Steps 5.1.14 through 5.1.26 until leak check is successful.

**OR**

**IF** unable to pass leak check, **NOTIFY** FWS for resolution.
5.2 Perform Functional Test of PSV-RW-3

5.2.1 NOTIFY WRPS QAT coverage is required for data verification.

5.2.2 ENSURE Test Assembly PI-1 isolation valve V3 (Figure 2) is Open.

5.2.3 OPEN Test Assembly isolation valve V1 (Figure 2).

5.2.4 START “Leak Check Vacuum Test Assembly” vacuum pump.

NOTE – Gauge “PI-2” (Figure 1) is an absolute pressure gauge (psia).

5.2.5 RECORD the beginning pressure at PI-2 (Figure 1) __________psia.

FWS/Technician Signature / Print (First & Last) / Date

WRPS QAT Signature / Print (First & Last) / Date

NOTE – When Step 5.2.6 is performed the raw water line containing PSV-RW-3 will commence being evacuated and the vacuum regulator VRV-2 can be adjusted.

5.2.6 SLOWLY OPEN valve 5-28 (Figure 1).

NOTE – PSV-RW-3 has a spring with a cracking pressure of 0.5 psi or 1.0 in. Hg and may open and close while VRV-2 is being adjusted.

- At the adjusted vacuum range in Step 5.2.7, the check valve/vacuum breaker is expected to remain closed.

- Vacuum regulating valves VRV-1 and VRV-2 turn clockwise to increase the amount of vacuum. If the valve is turned fully counter clock wise, the vacuum should be approximately 0 in. Hg downstream.

5.2.7 SLOWLY ADJUST vacuum regulating valve VRV-2 (Figure 2) to approximately 0 in. Hg as read on the vacuum gauge PI-1B.

5.2.8 ADJUST vacuum regulating valve VRV-1 (Figure 2) to establish a vacuum range of 1 to 5 in. Hg on vacuum reservoir as read on M&TE vacuum gauge PI-1 (Figure 2) AND

ALLOW system to stabilize.
5.2 Perform Functional Test of PSV-RW-3 (Cont.)

5.2.9 **GRADUALLY INCREASE** vacuum to raw water line by adjusting VRV-2 (Figure 2) until PSV-RW-3 opens to relieve vacuum.

**NOTE** - A decrease in the pressure reading of approximately 0.5 psia as read on M&TE gauge PI-2 is an indication that PSV-RW-3 is open.

5.2.10 **RECORD** the ending pressure on PI-2 at which PSV-RW-3 relieved vacuum.

Vacuum relieved at: __________ psia.


FWS/Technician Signature / Print (First & Last) / Date

WRPS QAT Signature / Print (First & Last) / Date

5.2.11 **RECORD** pressure differential at which PSV-RW-3 opened:

Starting Pressure minus (-) Ending pressure = __________ (≤3.0 psia).

5.2.12 **STOP** the “Leak Check Vacuum Test Assembly” vacuum pump.

5.2.13 **IF** vacuum relief is not in tolerance, **PERFORM** the following:

5.2.13.1 **CLEAN AND/OR REPAIR** PSV-RW-3

5.2.13.2 **DOCUMENT** actions taken on Comments Sheet.

5.2.13.3 **REPEAT** Steps 5.2.1 through 5.2.12 **AND**

**IF** PSV-RW-3 vacuum relief is still not in tolerance, **NOTIFY** FWS of failure.

5.2.14 FWS/Technician **VERIFY** pressure differential at which PSV-RW-3 opened is ≤3.0 psia.


FWS/Technician Signature / Print (First & Last) / Date

WRPS QAT Signature / Print (First & Last) / Date
5.3 Restoration

5.3.1 RELIEVE vacuum from test assembly and raw water piping.

5.3.1.1 ENSURE “Leak Check Vacuum Test Assembly” isolation valve V1 is open.

5.3.1.2 ENSURE “Leak Check Vacuum Test Assembly” isolation valve V3 is closed.

5.3.1.3 REMOVE Secondary Vacuum Gauge PI-1.

5.3.1.4 SLOWLY OPEN “Leak Check Vacuum Test Assembly” isolation valve V3 to relieve vacuum.

5.3.2 CLOSE valve 5-28 AND

DISCONNECT “Leak Check Vacuum Test Assembly”.

5.3.3 REPLACE AND TIGHTEN the cap on valve 5-28.

5.3.4 CLOSE valve 5-28A AND

REMOVE pressure gauge PI-2 from valve 5-28A.

5.3.5 REPLACE AND TIGHTEN the cap on valve 5-28A.

5.3.6 OPEN valve 5-32.

5.3.7 OPEN valve 5-33.

NOTE – If check valve/vacuum breaker does not re-seat properly, water may leak past valve.

5.3.8 OBSERVE for leaks coming from PSV-RW-3 water drain line/air inlet line (see Figure 1) AND

RECORD the Observation below.

Leaks observed from the PSV-RW-3 water drain line (✓):

YES [ ] NO [ ]

5.3.8.1 IF leaks are observed from the PSV-RW-3 water drain line, NOTIFY Shift Manager/FWS.

5.3.9 IF any problems were encountered with the functional check, INFORM FWS.
5.4 Acceptance Criteria

Acceptance Criteria has been met when Steps in this procedure have been satisfactorily performed and PSV-RW-3 meets the given specifications and tolerance(s).

5.5 Review

5.5.1 INFORM FWS test is complete.

5.5.2 FWS REVIEW AND ENSURE the following:

- Completed functional test meets the acceptance criteria
- Promptly notify Out-of-Tolerance conditions to the Shift Manager.
- Comments sections are filled out appropriately
- Work requests needed as a result of this procedure are identified and generated
- Work request number(s) of any work documents generated as a result of this procedure are recorded Comment Sheet 1.

5.6 Records

This procedure is performed within a work package, as such, the procedure in its entirety will be maintained as a record per the Work Control process.

The record custodian identified in the Company-level Records Inventory and Disposition Schedule (RIDS) is responsible for record retention in accordance with TFC-BSM-IRM_DC-C-02.
Figure 1 – PSV-RW-3 Check Valve/Vacuum Breaker and Raw Water Line

Connect Primary Gauge PI.2

M&TE Primary Gauge PI 2 = Heise gauge 0 to 30 psia

From Water Source

Connect to “Leak Check Vacuum Test Assembly” at Valve V.2
(see Figure 2)

Water Drain/ Air Inlet Line

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**Figure 2 – Leak Check Vacuum Test Assembly**

M&TE Secondary Gauge PI-1 = 0 – 30 in. Hg Vacuum

Information Only Gauges PI-1A & PI-1B = 0 – 30 in. Hg Vacuum