Start Up 242 A Evaporator System

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1.0 PURPOSE AND SCOPE

1.1 Purpose

To provide instructions for starting up the 242-A Evaporator for Cold Run training/testing purposes or Hot Run campaign.

1.2 Scope

This procedure applies to the 242-A Evaporator, its systems, and components.

2.0 INFORMATION

2.1 General Information

2.1.1 SIC-PB2-1 (G15/15, F10) SLURRY PUMP SPEED CONTROLR will require several seconds for the change from MANUAL to AUTO mode to take effect.

2.1.2 When filling the C-A-1 vessel initially with water, LI-CA1-3G will not register until approximately 1800 gallons of water has been added. LIC-CA1-1 and LIC-CA1-2 will not give an indication of level until approximately 19,500 gallons of water have been recorded on the raw water totalizer.

2.1.3 DI-CA1-1 (G10, F2) EVAP CA1-1 SPG or DI-CA1-2 (G10, F2) EVAP CA1-2 SPG can be used with either LIC-CA1-1 or LIC-CA1-2. For ease of maintenance, DI-CA1-1 and LIC-CA1-1 should always be used together and DI-CA1-2 and LIC-CA1-2 should always be used together. However, level or density indicators can be selected as required by plant conditions.

2.1.4 Before FEED/SLURRY is introduced to the C-A-1 vessel for the first time at the start of the campaign, the Instrument Functional Test must be performed per TO-600-070 unless the time between campaigns is less than 182 days. The addition of any feed to the vessel prior to performing this functional test constitutes a TSR violation.

2.1.5 Section 5.10 may be performed at any time as directed by Shift Manager to reduce the volume in the C-A-1 vessel.

2.1.6 Changing conditions or Management direction may require exiting this procedure and entering into either TO-600-060 to perform system shut down or TO-650-140 to flush vessel, recirculation loop, and de-entrainer pads.
2.1 General Information (Cont.)

2.1.7 As Evaporator vacuum is increasing, several readings from the vessel vent system may become erratic and it may be necessary to restart the vessel vent system several times during the initial vacuum jet startup, readings should return to normal as the Evaporator vacuum stabilizes.

PDI-DUC1 (G20, F20) VESSEL VENT DE-ENTRN DELTA P may show High ΔP readings; this is an acceptable condition as Evaporator vacuum is increasing.

If indications on Current Trend Display #21 do not show any decrease of PDI-DUC1, Valve 3-1 may be allowed to be closed down approximately 10° to 30° temporarily as vacuum is initially being drawn.

FI-AS-5 (G20, F20) VESSEL VENT EXHAUST FLOW reading may drop to 0 as moisture interferes with the flow sensing element and is an acceptable condition as Evaporator vacuum is increasing.

The vessel vent HEPA filters will continue to read a ΔP across them, which will show that there is still flow through the vessel vent system. A high ΔP across the vessel vent HEPA filters is an unacceptable condition and will require the vessel vent system and the steam jets to be shut down. The high ΔP limits are:

- PDI-FC5-1 (G20, F20) VESSEL VENT 1st – HEPA DELTA P: 3.0 inches WG
- PDI-FC5-2 (G20, F20) VESSEL VENT 2nd – HEPA DELTA P: 2.0 inches WG
- PDI-FC512 (G20, F20) VESSEL VENT 1st and 2nd Stage HEPA DELTA P: 5.0 inches WG.

Pressure fluctuations occurring from shutting down the EX-C-1 Exhauster could also result in the weight factor instrumentation reading low-low, which will shut down the PB-1 recirculation pump and possibly lead to an automatic Pot Dump 8 minutes after the shut down.

When Evaporator pressure is lowered below the saturation point of the Pot contents, violent boiling (flashing) may occur, which will be indicated by an increase in ΔP across the C-A-1 De-entrainers and a sharp increase in flow to the C-100 tank as indicated on FI-EC1-2. Another indication of flashing may be a high radiation reading on Radiation Monitor RE-CA1-1, which alarms to the MCS at 8000 cps.

As vacuum is being drawn on the C-A-1 vessel, pressure indicators PI-EC3-2 and PI-EC2-2 may alarm, showing an over-range condition and is acceptable as vacuum is increasing.
2.1 General Information (Cont.)

2.1.8 When slurry (Hot Run) or water flush is recirculating through the Evaporator Loop, FI-CA1-3 will normally read between 40 gpm and 270 gpm.

A bypass recirculation flow rate as read on instrument FI-CA1-3 (G12, F5/10) RECIRC BYPASS SLURRY FLOW, of less than 40 gpm could be an indication of one of the following:

- Plugging in the bypass recirculation line
- A plugging and/or cavitation in the main recirculation line just ahead of PB-1 pump
- A problem with the PB-1 pump
- A flow instrument (FI-CA1-3) problem/malfunction.

A bypass recirculation flow rate of greater than 270 gpm could be an indication of one of the following:

- Plugging/Scaling in the reboiler tubes
- A flow instrument (FI-CA1-3) problem/malfunction.

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Personnel Safety

3.1.1 Per DOE-0359, an Electrical Risk Assessment (ERA) is not required for DC circuits; single-phase circuits; or three phase circuits rated less than 240 volts and supplied by transformers (or equivalent), or generator, rated at less than 125 kVA. The electrical components used in this procedure have been evaluated and fall within this exception.
3.2 Equipment Safety

**CAUTION** - Failure to prevent flashing of the Evaporator Pot contents as the vacuum is increased could lead to a shutdown of the vessel vent system and a possible contamination of the Process Condensate system.

**CAUTION** - Valving in steam to the Reboiler system too rapidly and failure to bleed off condensate properly could result in water or steam condensate induced hammers and could result in damage to steam piping and equipment.

**CAUTION** - Raising Reboiler Steam Flow too rapidly could also cause flashing of the Evaporator Pot contents which could lead to a high $\Delta P$ on the Evaporator Vessel de-entrainer pads. High $\Delta P$ on the Evaporator Vessel de-entrainer pad will cause an activation of Interlock #14. This interlock activates Interlock #39 (open vacuum breaker HV-EC1-1) which causes valve HV-EA1-1 to close (steam to the reboiler).

3.3 Radiation and Contamination Control

3.3.1 When work is performed in or when work will result in a high contamination, high radiation, or an airborne radioactivity area, then an approved work package or approved procedure must be developed which is reviewed by Radiological Control per the ALARA procedure TFC-ESHQ-RP_RWP-C-03.

3.3.2 A general Radiological Work Permit may be used to perform this procedure contingent upon no part of the activity being performed within a High Contamination Area, High Radiation Area, or Airborne Radioactivity Area.

3.4 Environmental Compliance

3.4.1 Immediately report any information concerning the following topical area(s) to Environmental per Environmental-On-Call list in accordance with TFC-ESHQ-ENV_FS-C-01 (WAC 173-303-640 (4)(c)(iv)):

- Any spills and/or releases
- Discovery of spilled or leaked waste to secondary containment or the inability to clean-up leaked waste within 24 hours of detection.
3.5 Limits

HNF-SD-WM-TSR-006, Tank Farms Technical Safety Requirements

SAC 5.8.3 Flammable Gas Controls for Inactive/Miscellaneous Tanks/Facilities

HNF-15279, Technical Safety Requirements for the 242-A Evaporator

LCO 3.1 C-A-1 Vessel Flammable Gas Control System

LCO 3.2 C-A-1 Vessel Waste High Level Control System

LCO 3.3 C-A-1 Vessel Seismic Dump System

AC 5.5.1.2 Minimum Operations Shift Complement

OPERATING SPECIFICATION DOCUMENTS (OSDs)

OSD-T-151-00012 Operating Specifications for the 242-A Evaporator Crystallizer (242-A)

12.2.2.1 Vessel Liquid Level

Vessel Liquid Level – sufficient to maintain a liquid volume in vessel between 21,500 and 26,000 gallons during continuous operations.

12.2.3 PB-1 Recirculation Pump Characteristics

Maximum Current: 260 amperes
Min/Max Seal Water Pressure: 35/90 psig
Min/Max Seal Water Flowrate: 0.25/3.0 gpm

12.2.4 PB-2 Slurry Pump Characteristics

Maximum Current: 224 amperes
Min/Max Seal Water Pressure: 60/75 psig
Min Seal Water Flowrate: 0.94 gpm
Max Discharge Pressure: 87 psig

WASHINGTON ADMINISTRATIVE CODE

Dangerous Waste Regulations

WAC 173-303-380 Facility Record Keeping

WAC 173-303-640 (4)(c)(iv)
4.0 PREREQUISITES

4.1 Special Tools, Equipment, and Materials

The following supplies will be needed to perform this procedure:

- Thermal gun
- Portable pH meter or litmus paper.

4.2 Performance Documents

The following procedures may be needed to perform this procedure:

- TO-600-002 242-A Evaporator Pre-Start Activities
- TO-600-031, Add Water to 242-A Evaporator C-A-1 Vessel
- TO-600-040, Adjust 242-A Evaporator Operating Parameters
- TO-600-055, Start Up and Shut Down Evaporator 10 Lb Steam System
- TO-600-056, Start Up and Shut Down Evaporator 90 Lb Steam System
- TO-600-060, Shut Down 242-A Evaporator System
- TO-600-070, Perform Evaporator Operability Functional Tests
- TO-600-123, Startup and Shutdown E-C-1, E-C-2, and E-C-3 Condensers
- TO-600-210, Operate PB-1 and PB-2 Seal Water Filter System
- TO-640-020, Operate 242-A Process Condensate System
- TO-650-140, Flush 242-A Evaporator Vessel, Recirculation Loop and De-Entrainer Pads
- TO-660-141, Inject Anti-Foam Chemicals into the 242-A Vapor/Liquid Separator C-A-1
- TFC-OPS-OPER-C-22, Control and Use of Administrative Locks.
4.3 Field Preparation

4.3.1 IF any of the following analog signal alarms occur during the performance of this procedure, NOTIFY Shift Manager AND REQUEST Shift Managers evaluation of the situation to determine if maintenance and/or a change in the process is required.

<table>
<thead>
<tr>
<th>ALARM</th>
<th>CAUSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNTR</td>
<td>Pulse in counter error</td>
</tr>
<tr>
<td>TMR</td>
<td>Pulse in timer error</td>
</tr>
<tr>
<td>UNDR</td>
<td>Input signal under range</td>
</tr>
<tr>
<td>IBAD</td>
<td>Input error</td>
</tr>
<tr>
<td>OCD</td>
<td>Open circuit detection</td>
</tr>
<tr>
<td>OVER</td>
<td>Input over range</td>
</tr>
<tr>
<td>OBAD</td>
<td>Error in sending output value to MUX</td>
</tr>
</tbody>
</table>

4.3.2 IF a FAULT alarm occurs during the performance of this procedure, PERFORM the following:

4.3.2.1 NOTIFY Shift Manager AND REQUEST evaluation.

4.3.2.2 IF Shift Manager determines CLEAR FAULT function can be used, INPUT CLEAR FAULT function.

NOTE - Use of override function more than one time requires engineering concurrence.

4.3.2.3 IF CLEAR FAULT function fails to clear the alarm, REQUEST Shift Manager evaluate OVERRIDE function.

   a. INPUT OVERRIDE function.

   b. IF FAULT alarm clears, PROCEED to previous location in procedure.

   c. IF FAULT alarm remains activated, CONTACT engineering/maintenance.

4.3.3 CONFIRM that Central Shift Manager has received confirmation that Shift Production Team has met all requirements and operation is ready to begin.
4.3 Field Preparation (Cont.)

4.3.4 ENSURE the following conditions have been met before continuing this procedure:
- 242-A Evaporator pre-start activities have been completed per TO-600-002
- Seal water is available per TO-600-210 (Started and then put in short term shutdown)
- Condenser cooling water is in service per TO-600-123.

4.3.5 IF FI-CA1-20 (G400) is not reading 4.5 to 6 scfm, ADJUST FT-CA1-20 (condenser room, 5th floor, South End of East Wall, Top Row of Instrument Rack) to 4.5 to 6 scfm (read on FI-CA1-20).

4.3.6 ENSURE that HV-CA1-1 (G301/8, F0) EVAP FEED VALVE status is CLOSED.

4.3.6.1 CHECK HV-CA1-1 (G301/8, F0) interlock is clear.

4.3.6.2 IF yellow diamond appears above valve, PERFORM the following:
   a. SELECT HV-CA1-1 (G301/8) valve graphic.
   b. SELECT yellow diamond in lower left corner.
   c. SELECT DEVICE STATE RESET BUTTON.
   d. CHECK HV-CA1-1 (G301/8) valve closes.
5.0 PROCEDURE

NOTE - In Shutdown Mode, multiple and redundant tasks are performed within this procedure. Individual Sections 5.1 through 5.10 and 5.13 may be performed in any logical order as field conditions dictate. After Operation Mode is declared and verified, Sections 5.1 through 5.13 may be performed in any logical order as field conditions dictate.

- Section 5.10 may be performed at any time as directed by Shift Manager to reduce the volume in the C-A-1 vessel.

5.1 Establish Early Exit Criteria

NOTE - Changing conditions or Management direction may require exiting this procedure and entering into either TO-600-060 to perform system shut down or TO-650-140 to flush vessel, recirculation loop, and De-entrainer pads.

5.1.1 IF directed by Shift Manager due to changing conditions during the performance of this procedure, EXIT this procedure AND PERFORM one of the following:

5.1.1.1 ENTER into applicable section of TO-600-060 for system shut down,

OR

5.1.1.2 ENTER into applicable section of TO-650-140 for system flush.
5.2 Remove Administrative Locks and Position Breakers

5.2.1 PRIOR to removing the administrative locks from the feed pump ENSURE Central Shift Manager has confirmed the following:

- Campaign baseline data has been obtained
- The Shift Production Team has met all requirements
- Operation is ready to begin
- Tank Farms is prepared to receive waste.

5.2.2 IF directed by Shift Manager, REMOVE administrative locks AND ENERGIZE applicable breakers to start up Evaporator in accordance with the Administrative Lock Program from TFC-OPS-OPER-C-22.

5.2.2.1 IF waste pumps PB-2 Pump and/or 241-AW-P-102-1 Pump administrative locks are removed, PERFORM the following:

a. NOTIFY Central Shift Manager of administrative lock(s) are removed.

b. NOTIFY Central Shift Manager to START material balance.

5.2.3 START monitoring per TF-OR-A-04 and TF-OR-OSR-01.

5.3 Fill C-A-1 Vessel to Operating Range

5.3.1 IF vessel is empty or partially filled with water or feed/slurry AND IF directed by Shift Manager, FILL vessel up to operating range per TO-600-031 and return to this procedure.
5.4 Start PB-1 Recirculation Pump

5.4.1 IF directed by Shift Manager, SWITCH seal water source to process condensate per TO-600-210 and return to this procedure.

5.4.2 RECORD source of seal water in Data Sheet 1.

NOTE - PB-1 interlock is indicated by a yellow diamond above the PB-1 pump graphic (G12/6).

5.4.3 CHECK PB-1 interlock is clear (G12/6).

5.4.3.1 IF yellow diamond appears above pump, PERFORM the following:

a. SELECT PB-1 (G12/6) pump graphic.

b. SELECT yellow diamond in lower left corner.

c. SELECT DEVICE STATE RESET BUTTON.

5.4.4 START PB-1 (G12/6, F5) RECIRC PUMP.

5.4.5 CHECK II-PB1-1 (G12, F5) PB-1 RECIRC PUMP CURRENT reads 140 to 240 amps after 5 seconds.

5.4.5.1 IF II-PB1-1 does not read 140 to 240 amps after 5 seconds, PERFORM the following in the order given:

a. SHUT DOWN PB-1 (G12/6, F5) RECIRC PUMP.

b. SET PB1-BYPASS (G12/8, F5) to BYP ON status.

c. NOTIFY Shift Manager PB-1 requires maintenance.

5.4.6 RECORD II-PB1-1 (G12, F5) PB-1 RECIRC PUMP CURRENT on Data Sheet 1.

5.4.7 IF cold water function checks have not been performed, PERFORM Cold Water Functional Check per TO-600-070. (LCO 3.1)
5.5 **Line Up Steam to the Steam Jets**

5.5.1 **ENSURE** 90 Lb steam is in service per TO-600-056.

5.5.2 **ENSURE** HVEC2/3-1 (G16/7, F14) VACUUM JETS STEAM VALVE status is CF-CLOSD.

5.5.3 **CHECK** the following steam traps temperatures to verify proper trap operation.

<table>
<thead>
<tr>
<th>Trap Number</th>
<th>Allowable Inlet Temp Range °F (or ΔT ≥ 75 °F)</th>
<th>Allowable Outlet Temp Range °F (or ΔT ≥ 75 °F)</th>
<th>Location</th>
<th>Operating properly ✓</th>
<th>Y</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>242-A-7</td>
<td>290 to 335*</td>
<td>175 to 215*</td>
<td>HVAC Room</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>242-A-40</td>
<td>290 to 335</td>
<td>175 to 215</td>
<td>4th Level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>242-A-45</td>
<td>290 to 335*</td>
<td>175 to 215*</td>
<td>HVAC Room</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>242-A-51</td>
<td>275 to 335*</td>
<td>175 to 215*</td>
<td>HVAC Room</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.5.4 **IF** trap(s) are not operating properly, **NOTIFY** Shift Manager.

**NOTE** - After steam is routed to the steam jets, it may take several hours to blow down all of the condensate out of the steam lines. The time to blow down all the condensate out of the steam lines is dependent on how long the system has been shut down.

5.5.5 **IF** any steam leaks or pipe ruptures are found while examining the steam line, **IMMEDIATELY CLOSE** Valve S-409-70 AND **OPEN** blowdown Valve S-409-73.

5.5.5.1 **NOTIFY** Shift Manager of the problem.

5.5.6 **POSITION** the following valves as indicated.

<table>
<thead>
<tr>
<th>VALVE #</th>
<th>LOCATION</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-19</td>
<td>Condenser Room</td>
<td>OPEN</td>
</tr>
<tr>
<td>2-6</td>
<td></td>
<td>OPEN</td>
</tr>
<tr>
<td>2-7</td>
<td></td>
<td>OPEN</td>
</tr>
</tbody>
</table>

5.5.7 **PLACE** HC1-INLK1 (G20/10, F20) VES VENT HEATER INTERLOK BYPASS to BYPASS status.
5.6 Start Evaporator Vacuum

NOTE - Section 5.6 may not be performed prior to completion of Sections 5.2 through 5.5.

5.6.1 ENSURE HV-EC1-1 (G49/9) INTERLOK is clear for HV-EC1-1.

5.6.1.1 IF any HV-EC1-1 interlocks are active (see Table 3), ATTEMPT to clear the activated interlocks.
   a. SELECT HV-EC1-1 (G16/6) valve graphic.
   b. SELECT diamond in lower left corner.
   c. SELECT DEVICE STATE RESET BUTTON.

5.6.1.2 IF activated interlocks do not clear, NOTIFY Shift Manager.

5.6.2 SET HV-EC1-1 (G16/6, F14) VACUUM BREAKER VALVE to CLOSED status.

5.6.3 SET PIC-CA1-7 (G16/10, F14) EVAP ABSOLUTE PRESSURE to MANUAL and 100% output.

5.6.4 ENSURE HVEC2/3-1 (G49) INTERLOK is clear for HVEC2/3-1.

5.6.4.1 IF any HVEC2/3-1 interlocks are active (see Table 4), ATTEMPT to clear the activated interlocks.

5.6.4.2 IF activated interlocks do not clear, NOTIFY Shift Manager.

5.6.5 NOTIFY JCI of impending increase of 90# steam usage.

5.6.6 SET HV EC2/3-1 (G16/7, F14) VACUUM JETS STEAM VALVE to CF-OPEN, to start steam flow to the vacuum jets.
5.6 Start Evaporator Vacuum (Cont.)

CAUTION

Failure to prevent flashing of the Evaporator Pot contents as the vacuum is increased could lead to a shutdown of the vessel vent system and a possible contamination of the Process Condensate system.

NOTE – Interlock 56 is indicated by a yellow diamond above the valve HV-CA1-20 (G400/2). Interlock 56 clears at approximately 170 torr, HV-CA1-20 can be left open per the Process Memo.

5.6.7 ONCE Interlock 56 has cleared, CLOSE HV-CA1-20 (G400/2) or as specified in the Process Memo.

5.6.8 MONITOR PIC-CA1-7 (G16/10, F14) EVAP ABSOLUTE PRESSURE as Evaporator pressure decreases to 150 (140 to 160) torr (Step 2.1.7 provides additional information to assist the Operator).

5.6.9 WHEN Evaporator pressure has decreased to 150 (140 to 160) torr, SET PIC-CA1-7 to AUTO and a setpoint of 150 torr.

5.6.10 IF performing a deep flush; ADJUST PIC-CA1-7 setpoint to 165 TORR

5.6.10.1 IF vacuum is not stable, PERFORM step 5.6.13 through 5.6.13.11 as directed by Shift Manager.

5.6.10.2 RETURN to TO-650-140.

5.6.11 IF TI-CA1-6 (G10, F4) EVAP VESSEL SLURRY TEMP indicates less than or equal to 100°F, SET PIC-CA1-7 (G16/10, F14) EVAP ABSOLUTE PRESSURE to AUTO and setpoint of 60 torr or as specified in the Process Memo.
5.6 Start Evaporator Vacuum (Cont.)

5.6.12  **IF** TI-CA1-6 (G10, F4) EVAP VESSEL SLURRY TEMP indicates more than 100°F, **PERFORM** the following:

5.6.12.1 **USE** PIC-CA1-7 (G16/10, F14) EVAP ABSOLUTE PRESSURE in AUTO, **SLOWLY LOWER** PIC-CA1-7 setpoint not more than 5 torr of current setpoint.

5.6.12.2 **ALLOW** PIC-CA1-7 reading to stabilize at new setpoint value.

5.6.12.3 **UNTIL** PIC-CA1-7 pressure reading has reached a value of 60 torr or as specified in the Process Memo, **REPEAT** Steps 5.6.12.1 and 5.6.12.2.

5.6.13  **IF** process memo target torr cannot be achieved by the previous steps.

5.6.13.1 **OPEN** HV-CA1-20 (G400/2).

5.6.13.2 **SET** PIC-CA1-7 (G16/10,F14) to MANUAL with output 25%.

5.6.13.3 **MONITOR** PI-CA1-12 (G400) and PI-CA1-13 (G400).

5.6.13.4 **ONCE** 240 Torr is achieved, **SET** PIC-CA1-7 (G16/10,F14) to output 100%.

5.6.13.5 **ONCE** Interlock 56 has cleared, **CLOSE** HV-CA1-20 (G400/2) or as specified in the Process Memo.

5.6.13.6 **MONITOR** PIC-CA1-7 (G16/10, F14) EVAP ABSOLUTE PRESSURE as Evaporator pressure decreases to 150 (140 to 160) torr (Step 2.1.7 provides additional information to assist the Operator).

5.6.13.7 **WHEN** Evaporator pressure has decreased to 150 (140 to 160) torr, **SET** PIC-CA1-7 to AUTO and a setpoint of 150 torr.

5.6.13.8 **IF** TI-CA1-6 (G10, F4) EVAP VESSEL SLURRY TEMP indicates less than or equal to 100°F, **SET** PIC-CA1-7 (G16/10, F14) EVAP ABSOLUTE PRESSURE to AUTO and setpoint of 60 torr or as specified in the Process Memo.
5.6 Start Evaporator Vacuum (Cont.)

5.6.13.9 **IF** TI-CA1-6 (G10, F4) EVAP VESSEL SLURRY TEMP indicates more than 100°F, **PERFORM** the following:

a. **USE** PIC-CA1-7 (G16/10, F14) EVAP ABSOLUTE PRESSURE in AUTO, **SLOWLY LOWER** PIC-CA1-7 setpoint not more than 5 Torr of current setpoint.

b. **ALLOW** PIC-CA1-7 (G16/10,F14) reading to stabilize at new setpoint value.

5.6.13.10 **IF** process memo target Torr still cannot be achieved, **REPEAT** Step 5.6.13.

5.6.13.11 **IF** after 2 attempts target Torr is not achieved, contact engineering.

5.6.14 **CHECK** that FI-AS-5 (G20/F20) VESSEL VENT EXHAUST FLOW is indicating a consistent flow of 500 to 750 cfm.

5.6.14.1 **IF** FI-AS-5 is not indicating a consistent flow of 500 to 750 cfm, **ADJUST** Valve 3-1, located on the third floor of the Condenser Room.

5.6.15 **IF** PDI-DUC1 (G20, F20) VESSEL VENT DE-ENTRNX DELTA P shows high ΔP, **CLOSE DOWN** valve 3-1 to approximately 10 to 30 degrees for up to 2 minutes **AND**

**RETURN** valve 3-1 to as found position (Step 2.1.7 provides additional information to assist the Operator).

5.6.16 **IF** purge airline integrity test has not been performed, **PERFORM** tests per TO-600-070. (LCO 3.1, LCO 3.2)
5.7 Start De-Entrainer Sprays

5.7.1 **IF** directed by Shift Manager that De-Entrainer sprays are to remain off at this time, GO TO Section 5.8.

5.7.2 **ENSURE** that FV-CA1-6 isolation valve 5-97 is OPEN.

5.7.3 **ENSURE** FIC-CA1-6 (G10/5, F3) UPPER DE-ENTRN SPRAY FLOW is set to MANUAL at 100% output.

5.7.3.1 **SELECT** START 10 for HV-PDSPRY (G10/4, F3) DE-ENTRN PADSPRAY VALVES to CA1-10.

5.7.3.2 **SLOWLY OPEN** FIC-CA1-6 (G10/5, F3), (with each adjustment at a maximum value of 5% less than the current output).

5.7.3.3 **WHEN** the flow stabilizes at 1.7 – 2.1 gpm, **SET** FIC-CA1-6 (G10/5, F3) to AUTO and SETPOINT OF 1.9 gpm.

5.7.3.4 **ONCE** FIC-CA1-6 (G10/5, F3) is set in AUTO, **ENSURE** HV-PDSPRY (G10/4) de-entrainer sprays are cycling.
5.8 Line Up Steam to the Reboiler

5.8.1 ENSURE 10 Lb steam is in service per TO-600-055.

5.8.2 CHECK the following steam trap temperature to verify proper trap operation:

<table>
<thead>
<tr>
<th>Trap Number</th>
<th>Allowable Inlet Temp Range °F (*or ΔT ≥ 40 °F)</th>
<th>Allowable Outlet Temp Range °F (*or ΔT ≥ 40 °F)</th>
<th>Location</th>
<th>Operating Properly</th>
<th>Operating Properly</th>
<th>Operating Properly</th>
</tr>
</thead>
<tbody>
<tr>
<td>242-A-5</td>
<td>210 to 245*</td>
<td>175 to 215*</td>
<td>HVAC Room</td>
<td>Y</td>
<td>N</td>
<td>N/A</td>
</tr>
</tbody>
</table>

5.8.3 IF valve H-16 is open, CHECK the following steam trap temperature to verify proper trap operation:

<table>
<thead>
<tr>
<th>Trap Number</th>
<th>Allowable Inlet Temp Range °F (*or ΔT ≥ 40 °F)</th>
<th>Allowable Outlet Temp Range °F (*or ΔT ≥ 40 °F)</th>
<th>Location</th>
<th>Operating Properly</th>
<th>Operating Properly</th>
<th>Operating Properly</th>
</tr>
</thead>
<tbody>
<tr>
<td>242-A-6</td>
<td>210 to 245*</td>
<td>175 to 215*</td>
<td>HVAC Room</td>
<td>N</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

5.8.4 IF the traps are not operating properly, NOTIFY Shift Manager.

CAUTION

Valving in steam to the Reboiler system too rapidly and failure to bleed off condensate properly could result in water or steam condensate induced hammers and could result in damage to steam piping and equipment.

5.8.5 IF valve H-16 is CLOSED, PERFORM Steps 5.8.5.1 through 5.8.5.6:

5.8.5.1 OPEN H-23 bypass valve.

5.8.5.2 SLOWLY OPEN Valve H-16, UNTIL valve is fully OPEN.

5.8.5.3 EXAMINE steam line for proper venting and condensate bleed off.

5.8.5.4 IF any steam leaks or pipe ruptures are found, EXIT area AND NOTIFY Shift Manager.
5.8 **Line Up Steam to the Reboiler (Cont.)**

**NOTE** - It may be difficult to visually determine if dry steam is coming out of each blowdown.

5.8.5.5 **IF** it cannot be visually determined that dry steam is coming out of the individual blowdowns, **USE** the thermal gun or equivalent to determine when dry steam is exiting the blowdown valves.

**NOTE** - When using the thermal gun and the temperature of the drain piping exiting the valves listed in Step 5.8.5.6 reaches a temperature greater than 190 °F, it is assumed dry steam is exiting these valves.

5.8.5.6 **AFTER** dry steam has been determined to be coming through H-22 and H-23 steam blowdown and bypass valves by visual observation or as indicated by the temperature of the drain piping exiting the valves reaching 190 °F or more, **CLOSE** the following valves:

- H-22
- H-23.

5.8.6 **CHECK** PI-EA1-14 (G13, F12) 10 PSI STEAM TO DESUP PRESSURE reads 8 to 14 psig **AND**

**IF** not within range, **NOTIFY** Shift Manager.

**NOTE** - If steam trap 242-A-6 was previously checked in Step 5.8.3, it doesn't need to be checked again.

5.8.7 **IF** not previously performed, **CHECK** the following steam traps temperature to verify proper trap operation.

<table>
<thead>
<tr>
<th>Trap Number</th>
<th>Allowable Inlet Temp Range °F (*or ΔT ≥ 40 °F)</th>
<th>Allowable Outlet Temp Range °F (*or ΔT ≥ 40 °F)</th>
<th>Location</th>
<th>Operating Properly</th>
</tr>
</thead>
<tbody>
<tr>
<td>242-A-6</td>
<td>210 to 245°F*</td>
<td>175 to 215°F*</td>
<td>HVAC Room</td>
<td></td>
</tr>
</tbody>
</table>

5.8.8 **IF** trap(s) not operating properly, **NOTIFY** Shift Manager.
5.9 Start Steam Flow to the Reboiler

**Special Instructions**

For initial reboiler steam start-up, FIC-EA1-1 output should not be raised more than 5% within approximately 15 minutes. After two 5% adjustments, FIC-EA1-1 output should not be raised more than 3% within approximate 5 minute intervals until boil-off is achieved.

**NOTE** - Section 5.9 may not be performed prior to completion of Sections 5.2 through 5.6 and Section 5.8.

- The process condensate system may be started per TO-640-020 while the rest of this section continues. Procedure TO-640-020 only needs to be in process, not complete, before proceeding to Step 5.9.4

The term “Steam Startup” is defined as the period of time where steam flow control valve, FV-EA1-1, is operated from fully closed to < 20% open and final hold time is completed.

The term “Steam Operation” is defined as the period of time where steam flow control valve, FV-EA1-1, is operated from >20% open with the final startup hold period completed.

5.9.1 ENSURE anti-foam chemicals are mixed in tank, TK-E-102 AND

ENSURE the antifoam system is operational

5.9.2 IF required by process memo, ENSURE anti-foam chemicals are being injected into C-A-1 per TO-660-141.

5.9.3 PERFORM TO-640-020 to start up the process condensate system AND

IF directed by Shift Manager, START PC-100 Pump.

5.9.4 NOTIFY JCI of impending increase of 10# steam usage.

5.9.5 ENSURE HV-EA1-4 (G14/1) steam condensate block valve is set to AUTO.
5.9 Start Steam Flow to the Reboiler (Cont.)

5.9.6 **POSITION** the following manual isolation valves as indicated to valve in the reboiler and steam condensate weir.

<table>
<thead>
<tr>
<th>VALVE #</th>
<th>VALVE ID</th>
<th>VALVE LOCATION</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>H-25</td>
<td>FV-EA1-1 isolation</td>
<td>HVAC Room</td>
<td>OPEN</td>
</tr>
<tr>
<td>H-30</td>
<td>FV-EA1-1 isolation</td>
<td></td>
<td>OPEN</td>
</tr>
<tr>
<td>HV-H-28</td>
<td>Trap 242-A-8 blowdown</td>
<td></td>
<td>OPEN</td>
</tr>
<tr>
<td>H-31</td>
<td>Reboiler blowdown</td>
<td></td>
<td>OPEN</td>
</tr>
<tr>
<td>2-9</td>
<td>HV-EA1-2 isolation</td>
<td>Condenser Room Second Level</td>
<td>OPEN</td>
</tr>
</tbody>
</table>

5.9.7 **ENSURE** valve 2-6 is OPEN.

5.9.8 **ENSURE** valve 2-7 is OPEN.

5.9.9 **CHECK** FI-CA1-3 (G12, F5) RECIRC BYPASS SLURRY FLOW F-2 is reading between 40 gpm and 270 gpm (Step 2.1.8 provides additional information to assist the Operator) **AND**

**IF** FI-CA1-3 (G12, F5) RECIRC BYPASS SLURRY FLOW F-2 is not reading between 40 gpm and 270 gpm, **NOTIFY** Shift Manager.

5.9.10 **SELECT** FV-EA1-1 (G13/10).

5.9.10.1 **SELECT** interlock diamond.

5.9.10.2 **ENSURE** FIC-EA1-1 interlock is in bypass.

5.9.10.3 **ENSURE** PI-EA1-1 interlock is in bypass.

5.9.11 **SELECT** FIC-EA1-1 (G13/8, F12) REBOILER STEAM FLOW **AND**

**SET** output to 0%.

5.9.12 **SELECT** ON to **CHANGE** FV-EA1-1 (G13/10) status from STM OFF to STM ON.

5.9.13 **CHECK** FV-EA1-1 (G13/10) status changes from STM OFF to STM ON.

5.9.14 **CHECK** HV-EA1-4 (G 14/1) is in Auto and Open.

5.9.15 **WHEN** PI-EA1-1 (G 13) reaches < 29 psia, **CHECK** that status changes to “PERMISSIVE ON” located on graphic 13.

5.9.16 **ALLOW** PI-EA1-1 to reach a value < 18.0 psia.
5.9 Start Steam Flow to the Reboiler (Cont.)

5.9.17 IF PI-EA1-1 reads < 29 psia, GO TO Step 5.9.19.

NOTE - FV-EA1-1 REBOILER STEAM FLOW VALVE will not go into “PERMISSIVE ON” until PI-EA1-1 reads less than 29 psia. If valve 2-13 is OPENED, Step 5.9.18 will bleed air pressure off the reboiler loop to allow FV-EA1-1 to go to Permissive On.

5.9.18 IF PI-EA1-1 reads ≥ 29 psia AND IF directed by Shift Manager, OPEN valve 2-13.

5.9.18.1 WHEN PI-EA1-1 (G13, F12) REBOILER STEAM INLET PRESSURE reaches a value less than 23 psia, PERFORM the following:

   a. CHECK “PERMISSIVE ON” status for FV-EA1-1 (G13).

   b. CLOSE valve 2-13.

5.9.19 WHILE raising steam flow to the reboiler, DRAIN condensate from the Reboiler Steam lines as follows:

5.9.19.1 MONITOR Valve HV-H-28 outlet.

5.9.19.2 AFTER Valve HV-H-28 outlet indicates only dry steam by visual observation or as indicated by the temperature of the drain piping exiting the valve reaching 190 °F or more, CLOSE the following Valves:

   • HV-H-28
   • H-31.

5.9.20 WHILE raising steam flow to the reboiler, MONITOR 10lb steam pressure and temperature, CA1 vessel temperature by SELECTING Current Trend #13 and #4 AND

   SELECT any other Current Trend desired.
5.9 Start Steam Flow to the Reboiler (Cont.)

5.9.21 SET FIC-EA1-1 (G13/8, F12) to manual AND PERFORM “STEAM STARTUP” to start steam flow to the reboiler.

5.9.21.1 SET FIC-EA1-1 (G13/8, F12) output to 10% and hold for 15 minutes.

5.9.21.2 SET FIC-EA1-1 (G13/8, F12) output to 15% and hold for 15 minutes.

5.9.21.3 SET FIC-EA1-1 (G13/8, F12) output to 20% and hold for 15 minutes.

5.9.21.4 AFTER the hold time at the 20% position, CONTROL steam at the direction of the shift manager.

5.9.22 NOTIFY JCI of impending increase of 10# steam usage.

5.9.23 WHEN “Steam Startup” is complete and steam flow is greater than 3,600 lbs/hr, PERFORM the following:

5.9.23.1 SELECT FV-EA1-1 (G13/10).

5.9.23.2 SELECT interlock diamond.

5.9.23.3 CLEAR FIC-EA1-1 interlock to normal.

5.9.24 IF raising FIC-EA1-1 (G13/8, F12) REBOILER STEAM FLOW, an output of 35% is obtained and a corresponding increase in steam flow, or an increase in CA1 vessel temperature as shown on current trend#4, is NOT observed, PERFORM the following to clean/blow down steam strainers SST-1, SST-2, and SST-3:

5.9.24.1 OPEN SST-1 Valve 2-12A for approximately 1 minute.

5.9.24.2 CLOSE SST-1 Valve 2-12A.

5.9.24.3 OPEN SST-2 Valve 2-15A for approximately 1 minute.

5.9.24.4 CLOSE SST-2 Valve 2-15A.

5.9.24.5 OPEN SST-3 Valve 2-18A for approximately 1 minute.

5.9.24.6 CLOSE SST-3 Valve 2-18A.
5.9 Start Steam Flow to the Reboiler (Cont.)

NOTE - When initially raising Reboiler Steam flow to achieve boil-off, steam flow should not exceed 20,000 lb/hr. Steam flow will be ramped up to the final value after Evaporator Feed is started.

- Once temperature in the CA1 vessel is rising at a steady rate it may not be necessary to add in any more steam until boil-off has started, as indicated by FI-EC-1-2.

5.9.25 SLOWLY RAISE FIC-EA1-1 (G13/8, F12) REBOILER STEAM FLOW until boil-off is achieved (necessary for function test of temperature instrumentation).

5.9.26 IF hot water function checks have not been performed, PERFORM Hot Water Functional Check per TO-600-070. (LCO 3.1)

5.9.27 IF steam isolation valve closure test has not been performed, PERFORM steam isolation valve closure test per TO-600-070. (LCO 3.1, LCO 3.2, LCO 3.3)

SPECIAL INSTRUCTIONS

For steam flow ranging from 10,000 lbs/hr to 20,000 lbs/hr incremental steps of a maximum 4,000 lbs/hr, with a hold time of 20 minutes, shall be used.

For steam flow greater than 20,000 lbs/hr incremental steps of a maximum 2,000 lbs/hr, with a hold time of 90 minutes or as directed by the Process Memo, shall be used.

5.9.28 NOTIFY JCI of impending increase of 10# steam usage.

5.9.29 SLOWLY RAISE FIC-EA1-1 (G13/8, F12) REBOILER STEAM FLOW to a value specified by Shift Manager or Process Memo.

5.9.29.1 MONITOR steam condensate temperature, TI-EA1-5 (G13, F13), for any increase above 190°F.

a. IF TI-EA1-5 (G13, F13) steam condensate temperature rises above 190°F REDUCE steam flow into the E-A-1 Reboiler, as measured at FE-EA1-1, UNTIL a temperature of below 190°F is maintained.

b. NOTIFY engineering of the condition.
5.9 Start Steam Flow to the Reboiler (Cont.)

5.9.29.2 **MONITOR** FI-EC1-2 (G10, F14) E-C-1 CONDENSR PC FLOW or current trend #16) flow value as reboiler steam flow is increased.

5.9.29.3 **CHECK** the following steam trap temperature to verify proper trap operation.

<table>
<thead>
<tr>
<th>Trap Number</th>
<th>Allowable Inlet Temp Range °F</th>
<th>Allowable Outlet Temp Range °F</th>
<th>Location</th>
<th>Operating Properly ✓</th>
</tr>
</thead>
<tbody>
<tr>
<td>242-A-8</td>
<td>150 to 240 °F</td>
<td>150 to 240 °F</td>
<td>HVAC Room</td>
<td></td>
</tr>
</tbody>
</table>

5.9.29.4 **IF** the trap is not operating properly, **NOTIFY** Shift Manager.

5.9.30 **IF** PC-100 was not started, **START** PC-100 per TO-640-020.

5.9.31 **IF** directed by Shift Manager, **START** De-Entrainer Pad Sprays per Section 5.7.

5.9.32 **IF** not previously started, **START** monitoring per TF-OR-A-04.

5.9.33 **SET** HC1-INLK1 (G20/10, F20) VES VENT HEATER INTERLOK BYPASS to NOBYPASS status once vessel temperature and condensate flow rates stabilize.
5.10 Reduce Evaporator Volume

**NOTE** - Section 5.10 may be performed at any time as directed by Shift Manager to reduce the volume in the C-A-1 vessel by draining a small portion out the feed line to AW-102.

5.10.1 **ENSURE** feed pump P-AW-102 (G301/7, F0) FEED PUMP is set to OFF.

5.10.2 **ENSURE** that HV-CA1-1 (G301/8, F0) EVAP FEED VALVE status is CLOSED.

**Drain to 241-AW-02E Feed Pit**

5.10.3 **CONFIRM** position of the following valve located in the 241-AW-02E feed pit: (TSR-006, AC 5.8.3)

<table>
<thead>
<tr>
<th>VALVE NUMBER</th>
<th>POSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>AW02E-WT-V-107</td>
<td>OPEN from PUMP to 3” SN-269 TO BLDG 242-A AND SN-272 TO PUMP PIT 02A</td>
</tr>
</tbody>
</table>

5.10.4 **SET** HV-CA1-1 (G301/8, F0) EVAP FEED VALVE status to OPEN:

5.10.5 **AFTER** the lower of LIC-CA1-1 (G10/9, F2) EVAP CA1-1 LEVEL CONTROLR or LIC-CA1-2 (G10/10, F2) EVAP CA1-2 LEVEL CONTROLR reads approximately 24,500 (23,500 to 25,000) gallons, **SET** feed valve HV-CA1-1 (G301/8, F0) EVAP FEED VALVE to CLOSED.

5.10.6 **REVIEW** completion of Steps 5.10.1 to 5.10.5.

____________________________ / ________________________/ ________________________
Signature Print (First & Last) Date
Shift Manager /OE

5.10.7 **RETURN** to applicable section of this procedure.
5.11 Start Evaporator Feed

**Set Up Feed Flowpath**

NOTE - Starting feed to 242-A Evaporator without being in OPERATION MODE will result in a TSR violation.

5.11.1 **CONFIRM** AW02E-WT-V-107 is in OPERATION Position (OPEN from PUMP to 3” SN-269 TO BLDG 242-A AND SN-272 TO PUMP PIT 02A).

5.11.2 **PRIOR** to removing the administrative locks from the feed pump **ENSURE** Central Shift Manager has received confirmation of the following:
- The Shift Production Team has met all requirements
- Operation is ready to begin
- Tank Farms is prepared to receive waste.

5.11.3 **IF** directed by Shift Manager, **REMOVE** administrative locks **AND** **ENERGIZE** applicable breakers to start up Evaporator in accordance with the Administrative Lock Program from TFC-OPS-OPER-C-22.

5.11.3.1 **NOTIFY** Central Shift Manager of administrative lock removal.

5.11.4 **PRIOR** to entering OPERATION MODE, **CONFIRM** 242-A Evaporator pre-start activities per TO-600-002 and TO-600-070 have been completed.

5.11.5 **PRIOR** to entering OPERATION MODE, **CONFIRM** minimum Operations Shift Complement per AC 5.5.1.2 and document per TFC-OPS-OPER-C-07.

5.11.6 **DIRECT** Shift Manager to document in 242-A Shift Manager log book that OPERATION MODE has been declared. (LCO 3.1, 3.2, 3.3)

5.11.7 **PERFORM** the following to set up feed flow path:

5.11.7.1 **CONFIRM** Tank Farm Material Balance has been started.

5.11.7.2 **REQUEST** from Shift Manager that an NCO be stationed at a TFMCS HMI, with continuous communications link between the NCO and the 242-A At-the-Controls Operator to monitor for leak detection and potential tank pressurization.

5.11.7.3 **CHECK** graphic #51 for any interlocks that may prevent AW-102 feed pump from starting. (See Table 2)

5.11.7.4 **CHECK** graphic #50 for any interlocks that may prevent valve HV-CA1-1 from opening. (See Table 1)
5.11 Start Evaporator Feed (Cont.)

5.11.8 REVIEW completion of Steps 5.11.7.1 to 5.11.7.4.

Signature / Print (First & Last) / Date
Shift Manager /OE

5.11.9 SET FIC-CA1-1 (G301/6, F0) EVAP FEED FLOW to MANUAL and output to 10%.

5.11.10 IF P-AW-102 (G301/7, F0) FEED PUMP status is ON, GO TO Step 5.11.20.

5.11.11 MONITOR the AW-102 feed current from any one (1) of the following locations:
- II-AW-102 (G301, F0) AW-102 Feed Pump Amps
- IY-AW-102-1 from TFMCS at Central Control Room
- Field Reading using portable ammeter.

5.11.12 SET P-AW-102 (G301/7, F0) FEED PUMP to ON status.

5.11.13 IF P-AW-102 (G301/7, F0) FEED PUMP status changes to ON, GO TO Step 5.11.18.

5.11.14 IF P-AW-102 (G301/7, F0) FEED PUMP does not start, and P-AW-102 status is not in INTERLOK, NOTIFY the Shift Manager.

NOTE - Only two attempts to start the feed pump are initially allowed.

5.11.15 IF P-AW-102 (G301/7, F0) FEED PUMP shows “fault” and “Shutdown”, CLEAR the “fault” and “Shutdown” condition AND

SET P-AW-102 (G301/7, F0) FEED PUMP to ON status.

NOTE - Steps 5.11.16 and 5.11.17 are based upon the pump motor manufacturers recommendation for allowable cold starts of the feed pump motor.

5.11.16 IF the first two attempts fail to start the P-AW-102 (G301/7, F0) FEED PUMP, WAIT 1 hour after the last attempt AND

INITIATE an additional attempt.
5.11 Start Evaporator Feed (Cont.)

5.11.17 IF the P-AW-102 (G301/7, F0) FEED PUMP fails to start on the third attempt, CONTACT the Shift Manager and Engineering to determine a path forward.

5.11.18 CHECK that AW-102 Feed Pump II-AW-102 (G301, F0) Current reads 13 to 30 amps per step 5.11.11.

5.11.18.1 IF II-AW-102 does not read 13 to 30 amps after 15 seconds, PERFORM the following:

a. SET P-AW-102 (G301/7, F0) FEED PUMP to OFF status.

b. ENSURE that HV-CA1-1 (G301/8, F0) EVAP FEED VALVE status is CLOSED.

c. NOTIFY Shift Manager that P-AW-102 requires maintenance troubleshooting.

5.11.19 RECORD AW-102 Feed Pump Current per Step 5.11.11 on Data Sheet 1.

5.11.20 IF P-AW-102 (G301/7, F0) FEED PUMP is running, SET HV-CA1-1 (G301/8, F0) EVAP FEED VALVE to OPEN status.

5.11.21 NOTIFY Central Shift Manager that feed from AW Farm to 242-A has started.

5.11.22 IF Evaporator Feed is to be controlled in AUTO based on Evaporator Level, GO TO Step 5.11.25.
5.11 Start Evaporator Feed (Cont.)

**Control Evaporator Volume in MANUAL Mode**

NOTE - Evaporator Volume control is considered as being in MANUAL (in Feed Flow Control) if FIC-CA1-1 is in AUTO with the Cascade OPEN. This mode controls Evaporator Volume by controlling the feed rate to the Evaporator.

5.11.23 **CHECK** FI-EC1-2 (G16, F14) E-C-1 CONDENSR PC FLOW Condensate Flow value.

5.11.24 **SET** FIC-CA1-1 (G301/6, F0) EVAP FEED FLOW to AUTO and the setpoint to match Condensate Flow rate.

5.11.24.1 **IF** the Cascade for FIC-CA1-1 is not OPEN (the Faceplate shows a green “C”), **SET** CASC to open the Cascade (a white “O”).

5.11.24.2 **SET** SETPOINT, to the Condensate Flow value as read on FI-EC1-2 (G16, F14) E-C-1 CONDENSR PC FLOW.

NOTE - FIC-CA1-1 setpoint may require some adjustment to correct for field device deficiencies to yield the correct flow value.

- FIC-CA1-1 will require readjustment if steam flow is changed, or if slurry flow is started.

5.11.24.3 **ADJUST** FIC-CA1-1 (G301/6, F0) setpoint as necessary to maintain Evaporator Volume at 23,500 to 25,000 gallons or per the range specified in the Process Memo. (OSD-T-151-00012, 2.2.1)

5.11.24.4 **GO TO** Step 5.11.30.
5.11 Start Evaporator Feed (Cont.)

**Control Evaporator Volume in AUTOMATIC Mode**

NOTE - Volume control is considered in AUTO (in Evaporator Level Control) if FIC-CA1-1 is operating in AUTO with the Cascade CLOSED. This controls Evaporator Vessel volume via the setpoint of the Level Controller LIC-CA1-1 or LIC-CA1-2.

5.11.25 **SET** SELECT-WF (G10/8, F2) POT WF SELECTOR FOR LEVL CONTROL to LIC-CA1-1 or LIC-CA1-2 as desired.

NOTE - Normally, DI-CA1-1 is used with LIC-CA1-1 and DI-CA1-2 is used with LIC-CA1-2, for ease of maintenance; however, either DI can be used with either LIC as needed.

5.11.26 **SET** SELECT-DI (G10/11, F2) POT SPG SELECTOR FOR LEVL CONTROL to DI-CA1-1 or DI-CA1-2 as desired.

5.11.27 **SET** FIC-CA1-1 (G301/6, F0) EVAP FEED FLOW to AUTO mode.

5.11.27.1 IF the Cascade for FIC-CA1-1 is OPEN (showing a white "O"), **SET** CASC to close the Cascade (displays a green "C").

5.11.28 **SET** the Level Controller LIC-CA1-1 or LIC-CA1-2 selected in Step 5.11.25 to AUTO mode with a setpoint of 24,500 gallons or level specified by Process Memo.
5.11 Start Evaporator Feed (Cont.)

Establish Final Reboiler Steam Flow

CAUTION

Raising Reboiler Steam Flow too rapidly could also cause flashing of the Evaporator Pot contents which could lead to a high ΔP on the Evaporator Vessel de-entrainer pads. High ΔP on the Evaporator Vessel de-entrainer pad will cause an activation of Interlock #14. This interlock activates Interlock #39 (open vacuum breaker HV-EC1-1) which causes valve HV-EA1-1 to close (steam to the reboiler).

5.11.29 MONITOR the following instruments while adjusting steam flow to the reboiler.

- PDI-CA1-1 (G10, F3) EVAP LOWER DE-ENTRN DELTA-P
- PDI-CA1-2 (G10, F3) EVAP UPPER DE-ENTRN DELTA-P
- FI-EC1-2 (G16, F14) E-C-1 CONDENSR PC FLOW
- PIC-CA1-7 (G10/10, F14) EVAP ABSOLUTE PRESSURE
- TI-CA1-6 (G10, F4) EVAP VESSEL SLURRY TEMP
- TI-EA1-7 (G13, F13) REBOILER INLET SLURRY TEMP.

NOTE - Step 5.11.30 can be performed at the same time as steam flow is raised in Step 5.11.32 and may be repeated as necessary until Condensate pressure and TI-DSH-2 temperature are stable.

5.11.30 MONITOR PI-EA1-1 (G13, F12) REBOILER STEAM INLET PRESSURE and TI-DSH-2 (G13, F12) DESUP INLET 10# STM TEMP or TI-DSH-3 (G13, F12) REBOILER STEAM INLET TEMP as Reboiler Steam flow is increased.

5.11.31 IF directed by Shift Manager, PERFORM Section 5.12, “Start Evaporator Slurry,” in parallel with Step 5.11.32.

5.11.32 ADJUST FIC-EA1-1 (G13/8, F12) REBOILER STEAM FLOW to attain the target SpG specified by Process Memo.

5.11.33 IF the Process Condensate System has not already been started up, START the Process Condensate System per TO-640-020 and return to this procedure.
5.12 Start Evaporator Slurry

NOTE - The Process Memo will specify when slurring out is to start and the value for slurry flow interlock. The Process Memo will specify which SpG instruments to use when initiating slurry flow (DI-CA1-1, DI-CA1-2, or DI-CA1-3).

5.12.1 ENSURE SC-PB2-1 VFD selector switch is positioned to Remote.

5.12.2 IF the C-A-1 vessel density has reached the target SpG per process memo AND

IF directed by Shift Manager, PERFORMING Section 5.12, “Start Evaporator Slurry” may be done in parallel with setting final reboiler steam flow.

5.12.3 OBTAIN Shift Managers approval to initiate slurry flow on Data Sheet 1.

5.12.4 ENSURE PB-2 seal water is in service per TO-600-210.

5.12.5 WHEN the designated SpG instrument indicates that slurry SpG has reached the target, PROCEED with initiating slurry flow.

5.12.5.1 REQUEST an NCO be stationed at a TFMCS HMI, with continuous communications link between the NCO and the 242-A At-the-Controls Operator to monitor for leak detection and potential tank pressurization.

5.12.5.2 SET Low Flow HS-SLF-SP (G15/18, F10) SLURRY FLOW INTERLOK SETPOINT to 42 gpm or 33 gpm per process memo.

5.12.6 RECORD FQI-CA1-4 (G15, F10) SLURRY TO FARMS TOTALIZER (X10) reading on Data Sheet 1.

5.12.7 IF gravity slurry transfer will be employed during the campaign as directed by the Process Memo or as directed by the Shift Manager, SET HV-CA1-2 (G15/11, F9) SLURRY FLUSH VALVES to MANUAL and SL OUT status.

5.12.7.1 CONTINUE monitoring per TF-OR-A-04 AND GO TO 5.12.29.
5.12 Start Evaporator Slurry (Cont.)

5.12.8 SET SIC-PB2-1 (G15/15, F10) SLURRY PUMP SPEED CONTROLR to MANUAL and to 0 % output.

NOTE - SIC-PB2-1 will require several seconds for the change from MANUAL to AUTO modes to take effect.

5.12.8.1 SET SIC-PB2-1 to AUTO mode.

5.12.8.2 IF SIC-PB2-1 shows an OPEN Cascade (a white "O"), SET CASC to close the Cascade (a green "C").

5.12.9 ENSURE FIC-CA1-4 (G15/14, F10) EVAP SLURRY FLOW is in AUTO mode.

NOTE - Software ILK:HV-CA1-2 clears to a normal state when HV-CA1-2 is set to SL OUT Status.

5.12.10 SET HV-CA1-2 (G15/11, F9) SLURRY FLUSH VALVES to MANUAL and SL OUT status.

5.12.11 CHECK that FQI-RW-1 (G15, F10) BOTTOMS FLUSH TOTALIZR (WIDE) is not increasing.

NOTE - Totalizer increase of up to 50 gallons is expected.

5.12.12 IF FQI-RW-1 (G15, F10) BOTTOMS FLUSH TOTALIZR (WIDE) totalizer value continues to increase ENSURE HV-CA1-2 (G15/11, F9) SLURRY FLUSH VALVES is in MANUAL and BLOCK status AND NOTIFY Shift Manager.

5.12.13 CHECK FIC-CA1-4 has a flow of at least 5 gal per min, AND IF not NOTIFY Shift Manager.

5.12.14 ALLOW Gravity flow for minimum of 2 min.

5.12.15 SELECT PB-2 pump on graphic (G15/6).

5.12.16 SELECT diamond in lower left corner of controller faceplate.

5.12.17 SELECT DEVICE STATE RESET BUTTON.

5.12.18 NOTIFY Shift Manager of any active PB-2 interlocks.
5.12 Start Evaporator Slurry (Cont.)

5.12.19 MONITOR II-PB2-1 (G15, F9) PB-2 SLURRY PUMP CURRENT reads less than 150 amps once the pump has been started.

5.12.20 SET PB-2 (G15/6, F9) PB-2 SLURRY TRANSFER PUMP to ON.

5.12.21 NOTIFY Transfer OE of PB-2 pump start and slurry transfer to slurry tank.

5.12.22 CHECK after 5 seconds that II-PB2-1 (G15, F9) PB-2 SLURRY PUMP CURRENT is less than 150 amps.

5.12.22.1 IF II-PB2-1 (G15, F9) PB-2 SLURRY PUMP CURRENT reads 150 amps or greater after 5 seconds, SET PB-2 (G15/6, F9) SLURRY TRANSFER PUMP to OFF AND

NOTIFY Shift Manager

5.12.23 AFTER Pump PB-2 is operating normally, SET FIC-CA1-4 (G15/14, F10) EVAP SLURRY FLOW to a value greater than the selected Low Flow Interlock setpoint as specified in Process Memo.

5.12.24 MONITOR PI-CA1-8 (G15, F10) PB-2 SLURRY DISCHARGE. (OSD-T-151-00012, 2.4)

5.12.24.1 IF PI-CA1-8 (G15, F10) PB-2 SLURRY DISCHARGE reading cannot be maintained less than 87 psig, SET PB-2 (G15/6, F9) SLURRY TRANSFER PUMP to OFF.

5.12.24.2 NOTIFY Shift Manager of potential Slurry Line blockage.

5.12.25 IF gravity slurry transfer will not be employed during the campaign, SET HV-CA1-2 (G15/11, F9) SLURRY FLUSH VALVES to AUTO mode.


5.12.27 RECORD II-PB2-1 (G15, F9) PB-2 SLURRY PUMP CURRENT on Data Sheet 1.

5.12.28 NOTIFY Central Shift Manager that slurry from 242-A to slurry tank has started.
5.12 Start Evaporator Slurry (Cont.)

5.12.29 IF Slurry Receiver Tank pressurization occurs, ENSURE that PB-2 (G15/6, F9) SLURRY TRANSFER PUMP is SHUT DOWN by setting PB-2 to OFF status AND SET HV-CA1-2 (G15/11, F9) SLURRY FLUSH VALVES to MANUAL and BLOCK status.

5.12.29.1 NOTIFY Shift Manager of the Slurry Receiver Tank pressurization.
5.13 Stop Evaporator Slurry and Flush Slurry Line

5.13.1 IF directed by Shift Manager to shut down the slurry out AND

IF PB-2 (G15/6, F9) SLURRY TRANSFER PUMP status is in ON, SET PB-2 to OFF status.

5.13.2 SET HV-CA1-2 (G15/11, F9) SLURRY FLUSH VALVES to MANUAL mode and BLOCK status.

5.13.3 CHECK FQI-RW-1 (G15, F10) BOTTOMS FLUSH TOTALIZR (WIDE) is not increasing.

5.13.3.1 IF FQI-RW-1 totalizer value is increasing, NOTIFY Shift Manager.

5.13.4 NOTIFY the Shift Manager that Slurry flow is stopped.

Flush Slurry Line to Current Slurry Receiver Tank

NOTE - Steps 5.13.5 through 5.13.10.1 may be performed at Shift Manager discretion.

5.13.5 RECORD initial FQI-RW-1 (G15, F10) BOTTOMS FLUSH TOTALIZR (WIDE) reading in gallons on Data Sheet 1.

5.13.6 IDENTIFY minimum slurry line flush volumes of applicable Slurry Receiver Tank/Tank Farms from table below.

<table>
<thead>
<tr>
<th>Tank Farm</th>
<th>Volume (gal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>241-AN</td>
<td>575</td>
</tr>
<tr>
<td>241-AW</td>
<td>200</td>
</tr>
<tr>
<td>241-AP</td>
<td>500</td>
</tr>
</tbody>
</table>

5.13.7 ADD minimum slurry line flush volume from Step 5.13.6 to FQI-RW-1 (G15, F10) BOTTOMS FLUSH TOTALIZR (WIDE) initial value from Step 5.13.5 to obtain FQI-RW-1 desired end reading AND

RECORD the desired end reading Data Sheet 1.

5.13.8 START slurry line flush as follows:

5.13.8.1 SET HV-CA1-2 (G15/11, F9) SLURRY FLUSH VALVES to MANUAL and FARM FLUSH position.
5.13 Stop Evaporator Slurry and Flush Slurry Line (Cont.)

5.13.9 **AFTER** FQI-RW-1 (G15, F10) BOTTOMS FLUSH TOTALIZR (WIDE) indicates at least minimum flush volume for slurry receiver tank in use as determined in Step 5.13.6, **SET** HV-CA1-2 (G15/11, F9) SLURRY FLUSH VALVES to BLOCK AND **RECORD** the ending FQI-RW-1 reading on Data Sheet 1.

5.13.10 **CHECK** that FQI-RW-1 (G15, F10) BOTTOMS FLUSH TOTALIZR (WIDE) is NOT increasing.

5.13.10.1 **IF** FQI-RW-1 totalizer value is continuing to increase, **NOTIFY** Shift Manager.

5.13.11 **RECORD** final flush volume on Data Sheet 1.
5.14 Records

5.14.1 PERFORM the following for records identified within this procedure.

5.14.1.1 RECORD the number of times the record was generated in applicable column

OR

PLACE a check mark (✓) in the N/A column.

5.14.1.2 SUBMIT the package for verification of completed records.

<table>
<thead>
<tr>
<th>Records Submittal Checklist</th>
<th>Number of times completed</th>
<th>N/A (✓)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.10 Reduce Evaporator Volume</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 5.10.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.11 Start Evaporator Feed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 5.11.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Sheets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Sheet 1 - 242-A Evaporator System Startup</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FWS/OE/Shift Manager SEND the completed records to the Central Shift Office for records retention.

_________________________ / _______________________ / ______________
Signature Print (First & Last) Date

FWS/OE/Shift Manager
# TSR Compliance

## Start Up 242 A Evaporator System

### Table 1 - Evaporator Feed Valve HV-CA1-1 Interlocks

<table>
<thead>
<tr>
<th>SOFTWARE INTERLOCKS</th>
<th>INTERLOCK CAUSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>EX-C-1</td>
<td>RI-VVB/G AND/OR RSH-VVB/G &gt; 2000 cpm</td>
</tr>
<tr>
<td></td>
<td>PDSH-FC51 &gt; 5.0 in. WG</td>
</tr>
<tr>
<td></td>
<td>PDI-FC5-1 &gt; 3.0 in. WG</td>
</tr>
<tr>
<td></td>
<td>PDI-FC5-2 &gt; 2.0 in. WG</td>
</tr>
<tr>
<td></td>
<td>PDI-FC512 &gt; 5.0 in. WG</td>
</tr>
<tr>
<td>WFSH-CA11</td>
<td>Evaporator Weight Factor &gt; 110 inches</td>
</tr>
<tr>
<td>WFSH-CA12</td>
<td></td>
</tr>
<tr>
<td>LI-CA1-1</td>
<td>Calculated Evaporator Level &gt; 65.80 in.</td>
</tr>
<tr>
<td>LI-CA1-2</td>
<td>Calculated Evaporator Level &gt; 65.45 in.</td>
</tr>
<tr>
<td>RSH-CA1-1</td>
<td>Process Condensate Line &gt; 8000 cps</td>
</tr>
<tr>
<td>RI-CA1-1</td>
<td></td>
</tr>
<tr>
<td>PDSH-CA1</td>
<td>Lower De-Entrainer ΔP &gt; 4.5 in. WG</td>
</tr>
<tr>
<td>PDI-CA1-1</td>
<td></td>
</tr>
<tr>
<td>PDI-CA1-2</td>
<td>Upper De-Entrainer ΔP &gt; 5.0 in. WG</td>
</tr>
<tr>
<td>PB-1</td>
<td>PB-1 not running and BYPASS off</td>
</tr>
<tr>
<td>YS-AW102</td>
<td>P-AW-102 pump off</td>
</tr>
</tbody>
</table>
### Table 2 - Feed Pump P-AW-102 Interlocks

<table>
<thead>
<tr>
<th>Software Interlocks</th>
<th>Interlock Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>EX-C-1</td>
<td>RI-VVB/G AND/OR RSH-VVB/G</td>
</tr>
<tr>
<td></td>
<td>PDSH-FC51</td>
</tr>
<tr>
<td></td>
<td>PDI-FC5-1</td>
</tr>
<tr>
<td></td>
<td>PDI-FC5-2</td>
</tr>
<tr>
<td></td>
<td>PDI-FC512</td>
</tr>
<tr>
<td>LI-CA1-1</td>
<td>Calculated Evaporator Level</td>
</tr>
<tr>
<td></td>
<td>&gt; 2000 cpm</td>
</tr>
<tr>
<td></td>
<td>&gt; 5.0 in. WG</td>
</tr>
<tr>
<td>LI-CA1-2</td>
<td>Calculated Evaporator Level</td>
</tr>
<tr>
<td></td>
<td>&gt; 65.45 in.</td>
</tr>
<tr>
<td>RI-CA1-1</td>
<td>Process Condensate Line</td>
</tr>
<tr>
<td></td>
<td>&gt; 8000 in.</td>
</tr>
<tr>
<td>PDI-CA1-1</td>
<td>Lower De-Entrainer ΔP</td>
</tr>
<tr>
<td></td>
<td>&gt; 4.5 in. WG</td>
</tr>
<tr>
<td>PDI-CA1-2</td>
<td>Upper De-Entrainer ΔP</td>
</tr>
<tr>
<td></td>
<td>&gt; 5.0 in. WG</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hardware Interlocks</th>
<th>Interlock Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>WFSH-CA11</td>
<td>Evaporator Weight Factor</td>
</tr>
<tr>
<td>WFSH-CA12</td>
<td>&gt; 110 inches</td>
</tr>
<tr>
<td>PDSH-FC51</td>
<td>De-Entrainer ΔP</td>
</tr>
<tr>
<td></td>
<td>&gt; 5.0 in. WG</td>
</tr>
<tr>
<td>RSH-VVB/G (RIAS-VV-2)</td>
<td>Vessel Vent β/γ Radiation</td>
</tr>
<tr>
<td></td>
<td>&gt; 2000 cpm</td>
</tr>
<tr>
<td>RSH-CA1-1</td>
<td>Process Condensate Line</td>
</tr>
<tr>
<td></td>
<td>&gt; 8000 cps</td>
</tr>
<tr>
<td>PDSH-CA1-1</td>
<td>Lower De-Entrainer ΔP</td>
</tr>
<tr>
<td></td>
<td>&gt; 4.5 in. WG</td>
</tr>
</tbody>
</table>
### Table 3 - Vacuum Breaker Valve HV-EC1-1 Interlocks

<table>
<thead>
<tr>
<th>Software Interlocks</th>
<th>Interlock Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDI-CA1-1</td>
<td>Lower De-Entrainer ΔP &gt; 4.3 in. WG</td>
</tr>
<tr>
<td>EX-C-1</td>
<td>RI-VVB/G AND/OR RSH-VVB/G &gt; 2000 cpm</td>
</tr>
<tr>
<td></td>
<td>PDSH-FC51</td>
</tr>
<tr>
<td></td>
<td>PDI-FC5-1</td>
</tr>
<tr>
<td></td>
<td>PDI-FC5-2</td>
</tr>
<tr>
<td></td>
<td>PDI-FC512</td>
</tr>
<tr>
<td>PDSH-CA1</td>
<td>Lower De-Entrainer ΔP &gt; 4.5 in. WG</td>
</tr>
<tr>
<td>PDI-CA1-2</td>
<td>Upper De-Entrainer ΔP &gt; 5.0 in. WG</td>
</tr>
</tbody>
</table>

#### Hardware Interlocks

<table>
<thead>
<tr>
<th>Interlock Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSH-VVB/G (RIAS-VV-2) Vessel Vent β/γ Radiation &gt; 2000 cpm</td>
</tr>
<tr>
<td>PDSH-CA1 Lower De-Entrainer ΔP &gt; 4.5 in. WG</td>
</tr>
</tbody>
</table>

### Table 4 - HVEC2/3-1 Vacuum Jets Steam Valve Interlocks

<table>
<thead>
<tr>
<th>Software Interlocks</th>
<th>Interlock Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZS-EC1-1C</td>
<td>Valve HV-EC1-1 NOT CLOSED</td>
</tr>
<tr>
<td>EX-C-1</td>
<td>RI-VVB/G AND/OR RSH-VVB/G &gt; 2000 cpm</td>
</tr>
<tr>
<td></td>
<td>PDSH-FC51</td>
</tr>
<tr>
<td></td>
<td>PDI-FC5-1</td>
</tr>
<tr>
<td></td>
<td>PDI-FC5-2</td>
</tr>
<tr>
<td></td>
<td>PDI-FC512</td>
</tr>
</tbody>
</table>

**Type:** CONTINUOUS  
**Document No.:** TO-600-030  
**Rev/Mod:** S-13  
**Release Date:** 01/14/2019  
**Page:** 44 of 46
### Table 5 - PB-2 Slurry Pump Interlocks

<table>
<thead>
<tr>
<th>Software Interlocks</th>
<th>Interlock Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>PB-2 ILK 15</td>
<td>LI-CA1-1 &lt; 35.88 inches</td>
</tr>
<tr>
<td></td>
<td>LI-CA1-2 &lt; 35.83 inches</td>
</tr>
<tr>
<td>HV-CA1-2</td>
<td>HV-CA1-2 Valve in EVAP FL, FARM FL, or BLOCK position</td>
</tr>
<tr>
<td>YS-PB2-IL</td>
<td>A Hardware Interlock is active</td>
</tr>
<tr>
<td>PSH-CA1-3*</td>
<td>Slurry Flush Line Pressure &gt; 235 psig</td>
</tr>
<tr>
<td>PI-CA1-8</td>
<td>Slurry Flush Line Pressure &gt; 87 psig</td>
</tr>
<tr>
<td>TSH-PB2-1*</td>
<td>Pump PB-2 Motor Windings Temperature High (internal to Motor - no setpoint)</td>
</tr>
<tr>
<td>PI-CA1-10</td>
<td>Pump PB-2 Seal Water Pressure &lt; 60 psig</td>
</tr>
<tr>
<td>FI-CA1-2</td>
<td>Pump PB-2 Seal Water Flow &lt; 0.96 gpm</td>
</tr>
<tr>
<td>YS-VFD-1</td>
<td>FAULT Condition at VFD</td>
</tr>
</tbody>
</table>

* These points are also Hardware Interlocks.
Data Sheet 1 - 242-A Evaporator System Startup

### Section 5.4 Start PB-1 Recirculation Pump

<table>
<thead>
<tr>
<th>Process Condensate</th>
<th>Filtered Raw Water</th>
</tr>
</thead>
</table>

**Step(5.4.2)**

Source of Seal Water to PB-1 and PB-2

**Reading**

(Step 5.4.6)

IL-PB1-1 (G12, F5) PB-1 RECIRC PUMP CURRENT (140-240 amps)

### Section 5.11 Start Evaporator Feed

**AW-102 FEED PUMP CURRENT (13 to 30 amps)**

(Step5.11.11)

### Section 5.12 Start Evaporator Slurry

<table>
<thead>
<tr>
<th>Shift Manager</th>
<th>Date/Time</th>
</tr>
</thead>
</table>

Permission to begin Evaporator Slurrying Out:

(Step 5.12.3)

<table>
<thead>
<tr>
<th>Signature</th>
<th>Print (First &amp; Last)</th>
</tr>
</thead>
</table>

FQI-CA1-4 (G15, F10) SLURRY TO FARMS TOTALIZR (X10) (Gallons)

(Step 5.12.6)

IL-PB2-1 (G15, F9) SLURRY PUMP CURRENT (<150 amps)

(Step 5.12.27)

### Section 5.13 Stop Evaporator Slurry and Flush Slurry Line

FQI-RW-1 (G15, F10) BOTTOMS FLUSH TOTALIZR (WIDE) (initial)

(Step 5.13.5)

FQI-RW-1 (G15, F10) BOTTOMS FLUSH TOTALIZR (WIDE) (desired final, minimum)

(Step 5.13.7)

FQI-RW-1 (G15, F10) BOTTOMS FLUSH TOTALIZR (WIDE) (ending reading)

(Step 5.13.9)

Final Flush Volume

(Step 5.13.11)

<table>
<thead>
<tr>
<th>Signature</th>
<th>Print (First &amp; Last)</th>
<th>Date</th>
</tr>
</thead>
</table>

Shift Manager