



Fluor Federal Services, Inc. Paducah Deactivation Project

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REVISION/CHANGE LOG			
Revision/Change Letter	Description of Changes	Pages Affected	Date of Revision/Change
0	Initial Release.	ALL	7/13/2015
0A	Revise connection methods and minor wording changes.	5-8, 10, 15-18, 20	7/24/2015
1	General revision to incorporate lessons learned.	ALL	9/03/2015
1A	Changes to valving and steps to improve flow and enhance process.	4, 6-9, 11-13, 16-29, 31-41	9/17/2015
2	Incorporate comments from lessons learned.	ALL	10/15/2015
3	Incorporate comments from operators and reformat.	ALL	1/15/2016
3A	Delete incorrect Step 6.5.19.C	20	2/10/16
3B	Correct valving steps in Section 6.9	47, 49, 50	2/12/16

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## 1.0 PURPOSE AND SCOPE

### 1.1 Purpose

To describe the general guidelines for conditioning/stabilizing new Portable Cell Treatment Cart (PCTC) system component(s) with fluorine (F<sub>2</sub>) before their use with Mixed Gas (MG) during In-Situ Chemical Treatments (ICT).

The purpose of conditioning/stabilization process is to provide:

- A controlled reaction with possible residual reactive contaminants with F<sub>2</sub>, thereby reducing the potential for destructive reactions during ICT.
- A metal fluoride film to reduce consumption of MG during ICT.

### 1.2 Scope

PCTC systems are used at the Fluor Paducah Deactivation Project (FPDP) to remove Uranyl Fluoride (UO<sub>2</sub>F<sub>2</sub>) deposits from the interior surfaces of process equipment. PCTC system component(s) must be conditioned/stabilized before being placed in service due to the potential for hot metal reactions with potential contaminants. Together, the C-410-D and C-410-K facilities provide a suitable location for passivation of the PCTC system component(s).

## 2.0 REFERENCES

### 2.1 Use References

- CP3-HS-2012, *Construction and Work Zone Barricades and Signs*
- CP3-OP-0020, *Use of Atmosphere-Supplying Respirators*
- CP3-WM-1037, *Generation and Temporary Storage of Waste Materials*
- CP4-OP-0429, *Operation of the C-410-D and C-410-K Fluorine Distribution Centers*
- Job Hazard Analysis (JHA)-9492, *Passivation of PCTC Component(s) at C-410-D and C-410-K*

### 2.2 Source References

- CP1-NS-3000, *Documented Safety Analysis for the Department of Energy Paducah Site Deactivation Project*
- CP2-NS-2009, *Process Safety Information Fluorine System*
- CP3-HS-2003, *Respiratory Protection Program*
- Title V Operating Permit (V-14-012)

## 3.0 COMMITMENTS

29 Code of Federal Regulations (CFR) 1910.119

## 4.0 PRECAUTIONS AND LIMITATIONS

### 4.1 Precautions

- 4.1.1** Systems using fluorine may, over time, become contaminated with a powdery residue. This residue shall be handled with caution to prevent skin contact as it may contain small amounts of hydrofluoric acid.

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- 4.1.2 Gloves used for handling gaskets or that might touch connection surfaces should be stored in a clean, dry environment to preserve their integrity for use with F<sub>2</sub> systems.
- 4.1.3 Care should be taken when handling clean gloves to prevent contaminating those parts that will come in contact with gaskets or connection surfaces.
- 4.1.4 Extreme care must be taken to avoid contaminating gaskets or internal connection surfaces of pigtails, cylinder valves, or manifolds with oil, grease, or water.
- 4.1.5 Respiratory protection, **unless** directed otherwise by industrial hygiene, and loose-fitting leather gloves shall be worn **when** disconnecting components exposed to F<sub>2</sub> **or** whenever the possibility for contact with F<sub>2</sub> exists.
- 4.1.6 Care shall be taken to prevent releases when handling F<sub>2</sub>.
- 4.1.7 Bends and creases in soft copper tubing decrease the likelihood of a consistent metal fluoride film on the piping interior following passivation. Analytical Test Buggy (ATB), Sodium Fluoride (**NaF**) Trap Cart (NTC), and PCTC flexible hoses and piping component(s) should be handled with extreme care to avoid weakening and breaking off of the metal fluoride coating potentially exposing bare, unprotected base material.
- 4.1.8 Evacuating components/piping connected to the ATB or ATB recirculation piping with pressures **greater than 3 pounds per square inch absolute (psia)** with the purge pump may result in overheat and shut down due to activation of the thermal cut out switch. Keeping the purge pump suction pressure **less than 1000 millitorr (mTorr)** (as read on PIT-05) as much as possible during evacuation should keep the pump from overheating and extend pump life.

## 4.2 Limitations

- 4.2.1 Two Operations personnel [two operators or an operator and an Front Line Manager (FLM)] are required when valving F<sub>2</sub> through the C-410-K manifold pigtail.
- 4.2.2 **When** testing for fluorine leakage, aqueous solutions shall **NOT** come in contact with internal system piping/connections.
- 4.2.3 ATB system temperatures shall **NOT** exceed **130°F** due to the potential to damage the recirculating pumps.
- 4.2.4 PCTC system component(s) shall be limited to **25 psia** during passivation activities.
- 4.2.5 In the event that the F<sub>2</sub> Detector for the C-410-K Canopy area is out-of-service, continuous Industrial Hygiene (IH) support is required **unless** a portable hydrogen fluoride (HF) Detector is provided.
- 4.2.6 **If** used, **then** portable diesel generator shall be maintained **greater than 20 feet** away from C-410-D and C-410-K facilities.
- 4.2.7 The C-410-K manifold pigtail and associated piping shall be maintained at a positive pressure with nitrogen when **NOT** in use to keep the system dry.
- 4.2.8 Contaminated gaskets and/or connection surfaces shall be cleaned with Vertrel cleaner or an approved equivalent **and** shall be dry **prior** to connecting.

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**4.2.9** Used rags, gloves, and gaskets shall be disposed of in accordance with CP3-WM-1037, *Generation and Temporary Storage of Waste Materials*.

**4.2.10** **Before** breaking connections, all components exposed to F<sub>2</sub> shall be purged and evacuated.

**4.2.11** **When** handling F<sub>2</sub> piping connections or gaskets **or** when cleaning or installing connections with Vertrel Cleaner, or an approved equivalent, neoprene or nitrile gloves shall be worn.

**4.2.12** Storage of combustible materials for staging of PCTC components in the C-410-K canopy area shall be approved by Fire Protection Engineer.

## **5.0 PREREQUISITES**

**5.1** Verify that Operations personnel involved are current on the following training:

- CH190CR, *Overview of Fluorine Process Safety Management*
- CH190OJ, *Fluorine Distribution Systems On The Job Training Guide (OJT)*
- F00175, *Passivation of PCTC Components at C-410-D and C-410-K*

**5.2** Review JHA-9492, *Passivation of PCTC Component(s) at C-410-D and C-410-K*.

**5.3** **Before** performing any fluorine valving activities at C-410-K or C-410-D, ensure an alarm check in C-410-K has been performed during the previous **24 hours** according to CP4-OP-0429, *Operation of the C-410-D and C-410-K Fluorine Distribution Centers*.

**5.4** Confirm that the manifold pigtail connected to the C-410-K manifold is outfitted with an In-line Manual Isolation Valve (IMIV) to assist in flow control during charging and evacuation activities.

**5.5** Obtain the following test equipment, tools, and supplies, as necessary:

- Swagelok Variable Compression Ratio (VCR) gaskets or approved equivalent
- Open-ended wrenches
- Adapter fitting to connect manifold pigtail to NTC/ATB
- Pressure demand respirator(s) & breathing-air supply cart
- Flir thermal imager or equivalent
- Fuji multi-input portable thermometer/datalogger or equivalent
- Wheel chocks
- Loose-fitting leather gloves
- Neoprene or nitrile gloves
- Vertrel cleaner or other approved oxygen service cleaner equivalent
- Clean, lint-free rags
- Fluorine leak detection solution and/or strips – such as potassium iodide (KI) or Oxytech
- Portable generator, rated 100kW/125kVA or larger
- VCR fittings toolbox, equipped with items such as plugs, caps, and tee connectors

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5.6 Confirm with Engineering a satisfactory Criticality Accident Alarm System (CAAS) audibility evaluation has been documented for model of portable generator **prior** to its use.

## 6.0 INSTRUCTIONS

### 6.1 Preparing for PCTC Passivation Activities

#### Facility Operations Personnel

- 6.1.1 **If** during performance of this procedure it becomes necessary to shield PCTC components from weather and/or to maintain a heated environment, **then** close canopy curtains.
- 6.1.2 Align headers in C-410-D & C-410-K Facilities in accordance with Appendix F, *C-410-D and C-410-K Initial Valve Lineup for PCTC Component Passivation*.
- 6.1.3 Check nitrogen purge flow at the C-410-K Pigtail Buffer Bleed Valve (PBBV).
- 6.1.4 **If** nitrogen purge flow at PBBV is **NOT** detected, **then** contact FLM for further instructions.

#### NOTE:

A typical passivation lineup involves connecting the C-410-K manifold pigtail to the GL-01 connection of an NTC, then connecting a pigtail from the GL-02 connection of the NTC to the V-103 connection of an ATB, with any additional rigid/flexible piping and tubing connected to the V-104 and V-101 connections of the ATB. **If** an NTC will **NOT** be involved in the passivation activities, **then** the C-410-K manifold pigtail is connected to the V-103 connection of the ATB. An ATB is always necessary to be connected for any passivation activities.

- 6.1.5 **If** passivating a NTC, **then** perform Section 6.2 to connect NTC.
- 6.1.6 **If** passivating an ATB, **then** perform Section 6.3 to connect ATB.
- 6.1.7 **If** passivating rigid piping and/or additional flexible piping/tubing, **then** perform Section 6.4 to connect.
- 6.1.8 Go to Section 6.5 to perform passivation activities.

### 6.2 Connecting NTC for Passivation

#### Facility Operations Personnel

#### NOTE:

Supporting documentation that an NTC has never been connected to a uranium hexafluoride (UF<sub>6</sub>) system may include Quality Control (QC) hold tags indicating the NTC has never been placed in service, NTC Bill of Lading, and/or associated work package information.

- 6.2.1 Confirm NTC has **NOT** been previously aligned to a UF<sub>6</sub> system by verifying supporting documentation **and** record on CP4-OP-0120-F01, *C-410-K Passivation of PCTC Component(s) Checklist*.
- 6.2.2 Confirm NaF media has been installed in NTC through review of work package documentation.
- 6.2.3 Ensure NTC is positioned so that required pigtails can be connected without stressing or damaging the pigtails.

- 6.2.4 Ensure NTC will **NOT** impact use of C-410-K canopy curtains.
- 6.2.5 Lock casters **and** apply wheel brakes.
- 6.2.6 Ensure GL-01 is closed.

**CAUTION:**

**If** exposed to oil or water, **then** damage to fluorine connections, gaskets, or fittings may occur.

- 6.2.7 Connect C-410-K manifold pigtail to GL-01 connection on NTC as follows:
  - A. Don clean neoprene or nitrile gloves.
  - B. Disconnect the C-410-K manifold pigtail from the stanchion near PBBV at V-105.
  - C. Install dust cap on V-105 at C-410-K.
  - D. Don new pair of neoprene or nitrile gloves.
  - E. Replace used metal gasket(s) in adapter fitting with new metal gasket(s) **and** place used gasket(s) in appropriate waste container, as necessary.
  - F. Visually inspect C-410-K manifold pigtail and NTC connections for grease, oil, or corrosion. **If** grease, oil, or corrosion is present on connections, **then** clean by wetting a clean, lint-free rag with Vertrel cleaner or approved equivalent **and** wipe.
  - G. Ensure connections are dry prior to connecting the C-410-K manifold pigtail.
  - H. Request second qualified individual confirm connections are free of grease, oil, or corrosion and that they are dry.
  - I. **While** supporting the ends, connect the C-410-K manifold pigtail to the NTC with adapter fitting to ensure connection alignment.
  - J. Close IMIV.
  - K. **If** connection is VCR, **then** hand tighten connection **and** use open-ended wrenches to tighten an additional **1/8** turn.
  - L. **If** connection is other than VCR, **then** tighten connection using open end wrenches.
- 6.2.8 Ensure multi-input thermometer/datalogger temperature probes have been positioned **and** secured, as directed by FLM/SME.
- 6.2.9 Ensure the following NTC disconnect switches are in the OFF position:
  - 480 VAC DISCONNECT SWITCH
  - PLC CONTROL PANEL DISCONNECT SWITCH
- 6.2.10 Ensure 480 VOLTS supply disconnect or breaker is OPEN/OFF.

NOTE:

The electrical cord for the NTC is equipped with a splitter box with two different Meltric receptacles. The LOW TEMP receptacle is capable of supporting conditioning sessions ranging from no heat required **up through 250°F**. The HIGH TEMP receptacle is capable of supporting conditioning sessions with an oven temperature requirement **greater than 250°F**.

- 6.2.11 Connect electrical cord(s) from the 480 VOLTS supply receptacle to NTC through the HIGH TEMP receptacle.
- 6.2.12 **If** 480 VOLTS source is portable generator, **then** perform the following:
  - A. Ensure fuel tank level for generator is at least **7/8** full.
  - B. Ensure generator is running.
- 6.2.13 Position 480 VOLTS supply disconnect or breaker to CLOSED/ON.
- 6.2.14 Position the following NTC disconnect switches to ON position:
  - 480 VAC DISCONNECT SWITCH
  - PLC CONTROL PANEL DISCONNECT SWITCH

NOTE:

**When** starting fan, it may be necessary to station a qualified individual to check fan rotation.

- 6.2.15 Depress the following pushbuttons on the NTC control panel:
  - CONTROL POWER ON
  - CIRCULATION FAN START
- 6.2.16 Check circulation fan is rotating clockwise.
- 6.2.17 **If** circulation fan is rotating backward, **then** perform the following:
  - A. Depress the following pushbuttons on the NTC control panel:
    - CIRCULATION FAN STOP
    - CONTROL POWER OFF
  - B. Position the following NTC disconnect switches to OFF position:
    - 480 VAC DISCONNECT SWITCH
    - PLC CONTROL PANEL DISCONNECT SWITCH
  - C. Position 480 VOLTS supply disconnect or breaker to OPEN/OFF.
  - D. Unplug 480 VAC electrical cord(s) from NTC.
  - E. Replace electrical pigtail with alternate that has phases swapped **or** notify FLM to request Electrical Maintenance (EM) reverse leads.

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F. Reconnect electrical cord(s) from the 480 VOLTS supply receptacle to NTC through the HIGH TEMP receptacle.

G. Go to Step **6.2.13**.

**6.2.18** Set NTC oven temperature setpoint by adjusting PROCESS CONTROLLER to **130°F** or as directed by FLM.

**6.2.19** Depress HEAT ENABLE pushbutton.

**6.2.20** Monitor NTC oven temperature to ensure temperature is rising.

**6.2.21** If NTC oven temperature is **NOT** increasing, **then** perform the following:

A. Depress the following pushbuttons on the NTC control panel:

- HEAT DISABLE
- CIRCULATION FAN STOP
- CONTROL POWER OFF

B. Position the following NTC disconnect switches to OFF position:

- 480 VAC DISCONNECT SWITCH
- PLC CONTROL PANEL DISCONNECT SWITCH

C. Contact FLM for further instructions.

**6.2.22** Depress the following pushbuttons on the NTC control panel:

- HEAT DISABLE
- CIRCULATION FAN STOP
- CONTROL POWER OFF

### **6.3 Connecting ATB for Passivation**

#### **Facility Operations Personnel**

**NOTE:**

Supporting documentation that an ATB has never been connected to a UF<sub>6</sub> system may include QC hold tags indicating the ATB has never been placed in service, ATB Bill of Lading, and/or associated work package information.

**6.3.1** Confirm ATB has **NOT** been previously aligned to a UF<sub>6</sub> system by verifying supporting documentation **and** record on CP4-OP-0120-F01, *C-410-K Passivation of PCTC Component(s) Checklist*.

**6.3.2** Position ATB so that pigtails can be connected without stressing or damaging the pigtails.

**6.3.3** Ensure ATB will **NOT** impact use of C-410-K canopy curtains.

**6.3.4** Ensure ATB hitch is rotated underneath buggy.

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- 6.3.5 Chock wheels on ATB.
- 6.3.6 Isolate area around PCTC system being passivated according to CP3-HS-2012, *Construction and Work Zone Barricades and Signs*.
- 6.3.7 Ensure V-103 is closed.
- 6.3.8 Connect a plant air supply to ATB as follows:
  - A. Connect plant air supply connection to DRY AIR PURGE connection on ATB with an airline dedicated for PCTC use.
  - B. Slowly open the following valves to align air to ATB:
    - Plant air supply connection isolation valve
    - DRY AIR PURGE BLOCK #2 (if installed)
  - C. Ensure air regulator on ATB is adjusted to approximately **5 psig**.
  - D. Adjust Fourier Transform Infrared (FTIR) purge air flow meter to **between 200 and 500 liters per hour (lph)** as read from center of ball.
- 6.3.9 Ensure ATB 480V AC disconnect on POWER DISTRIBUTION PANEL and 480 VOLTS supply receptacle disconnect are in the OPEN/OFF position.
- 6.3.10 Ensure all breakers inside ATB POWER DISTRIBUTION PANEL are in up position and indicate red.
- 6.3.11 Connect electrical cord(s) from the 480 VOLTS supply receptacle fed from C-410-K to ATB.
- 6.3.12 Ensure the purge pump is turned off.
- 6.3.13 Ensure sample pump is unplugged from SAMPLE PUMP RECEPTACLE.
- 6.3.14 Ensure FTIR is unplugged.
- 6.3.15 Position 480 VOLTS supply receptacle disconnect to the CLOSED/ON position.
- 6.3.16 Position ATB 480V AC disconnect on POWER DISTRIBUTION PANEL to the ON position.
- 6.3.17 Ensure ATB instruments are on and Paducah Operator Interface (POINT) program starts up on FTIR computer screen.
- 6.3.18 Start purge pump as follows:

**NOTE:**

Due to orientation of the purge pump, an inspection mirror may be needed to check oil level.

- A. Check oil level in pump.
- B. **If** oil level in pump is **NOT** between Oil Level markings, **then** contact FLM for further instructions.

C. Turn on ATB purge pump using pump power switch.

**6.3.19** If at any time during performance of the remaining steps of this procedure it is desired to shutdown the purge pump, **then** perform the following:

A. Ensure FLM permission is received to turn off purge pump.

B. Close V-314.

C. Turn off ATB purge pump using pump power switch.

D. **When** desired to start ATB purge pump, **then** perform the following:

1. Turn on ATB purge pump using pump power switch.

2. Open V-314.

**CAUTION:**

**If** exposed to oil or water, **then** damage to fluorine connections, gaskets, or fittings may occur.

**6.3.20** If an NTC is connected, **then** connect pigtail between the GL-02 CONNECTION on the NTC to the V-103 CONNECTION on the ATB as follows:

A. Ensure GL-02 is closed.

B. Don clean neoprene or nitrile gloves.

C. Remove connection plugs and caps, as applicable, on pigtail and connections, **and** store for later use, such that potential contamination is avoided.

D. Don new pair of neoprene or nitrile gloves.

E. **If** connections are VCR, **then** replace used metal gasket(s) with new metal gasket(s). Place used gasket(s) in appropriate waste container, as necessary.

F. Visually inspect connections for grease, oil, or corrosion. **If** grease, oil, or corrosion is present on connections, **then** clean by wetting a clean, lint-free rag with Vertrel cleaner or approved equivalent **and** wipe.

G. Ensure connections are dry prior to connecting pigtail.

H. Request second qualified individual confirm connections are free of grease, oil, or corrosion and that they are dry.

I. **While** supporting the ends to ensure connection alignment, connect pigtail.

J. **If** connections are VCR, **then** hand tighten VCR connections **and** tighten an additional 1/8 turn using open end wrenches.

K. **If** connections are other than VCR, **then** tighten connections using open end wrenches.

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**6.3.21** If a NTC is connected, **then** connect Ethernet cable between ATB and NTC **and** confirm OVEN COMM button on Human Machine Interface (HMI) is green.

**6.3.22** If OVEN COMM button remains flashing red, **then** contact FLM for further instructions.

**CAUTION:**

**If** exposed to oil or water, **then** damage to fluorine connections, gaskets, or fittings may occur.

**6.3.23** If an NTC is **NOT** connected, **then** connect C-410-K manifold pigtail to V-103 connection on ATB as follows:

- A. Don clean neoprene or nitrile gloves.
- B. Disconnect the C-410-K manifold pigtail from the stanchion near PBBV at V-105.
- C. Install dust cap on V-105 at C-410-K.
- D. Don new pair of neoprene or nitrile gloves.
- E. Visually inspect C-410-K manifold pigtail and ATB connections for grease, oil, or corrosion. **If** grease, oil, or corrosion is present on connections, **then** clean by wetting a clean, lint-free rag with Vertrel cleaner or approved equivalent **and** wipe.
- F. Prior to connecting the C-410-K manifold pigtail, ensure connections are dry.
- G. Request second qualified individual confirm connections are free of grease, oil, or corrosion and that they are dry.
- H. **While** supporting the ends to ensure connection alignment, connect the C-410-K manifold pigtail to the ATB, installing new metal gasket.
- I. Close IMIV.
- J. **If** connection is VCR, **then** hand tighten connection **and** use open-ended wrenches to tighten an additional **1/8** turn.
- K. **If** connection is other than VCR, **then** tighten connection using open end wrenches.

#### **6.4 Connecting Additional Piping for Passivation**

##### **Facility Operations Personnel**

**NOTE:**

Supporting documentation may include QC hold tags indicating the piping/tubing has never been placed in service, piping/tubing Bill of Lading, and/or associated work package information.

**6.4.1** Confirm additional piping/tubing to be passivated has **NOT** been previously aligned to a UF<sub>6</sub> system by verifying supporting documentation **and** record on CP4-OP-0120-F01, *C-410-K Passivation of PCTC Component(s) Checklist*.

**6.4.2** Ensure piping/tubing will **NOT** impact use of C-410-K canopy curtains.

CAUTION:

If exposed to oil or water, **then** Damage to fluorine connections, gaskets, or fittings may occur.

6.4.3 Connect a pigtail to V-104 CONNECTION on ATB as follows:

- A. Don clean neoprene or nitrile gloves.
- B. Remove connection plugs and caps, as applicable, on pigtail and connections, **and** store for later use, such that potential contamination is avoided.
- C. Don new pair of neoprene or nitrile gloves.
- D. **If** connections are VCR, **then** replace used metal gasket(s) with new metal gasket(s). Place used gasket(s) in appropriate waste container, as necessary.
- E. Visually inspect connections for grease, oil, or corrosion. **If** grease, oil, or corrosion is present on connections, **then** clean by wetting a clean, lint-free rag with Vertrel cleaner **or** approved equivalent **and** wipe.
- F. Ensure connections are dry prior to connecting.
- G. Request second qualified individual confirm connections are free of grease, oil, or corrosion and that they are dry.
- H. **While** supporting the ends to ensure connection alignment, connect pigtail.
- I. **If** connections are VCR, **then** hand tighten VCR connections **and** tighten an additional  $1/8$  turn using open end wrenches.
- J. **If** connections are other than VCR, **then** tighten connections using open end wrenches.

CAUTION:

If exposed to oil or water, **then** damage to fluorine connections, gaskets, or fittings may occur.

6.4.4 **If** other sections of rigid or flexible piping/tubing are to be passivated, **then** connect piping/tubing as directed by FLM to pigtail at V-104 CONNECTION as follows:

- A. Ensure neoprene or nitrile gloves are donned.
- B. Remove connection plugs and caps, as applicable, on ends of piping/tubing to be connected **and** store for later use, such that potential contamination is avoided.
- C. Don new pair of neoprene or nitrile gloves.
- D. **If** connections are VCR, **then** replace used metal gasket(s) with new metal gasket(s). Place used gasket(s) in appropriate waste container, as necessary.
- E. Visually inspect connections for grease, oil, or corrosion. **If** grease, oil, or corrosion is present on connections, **then** clean by wetting a clean, lint-free rag with Vertrel cleaner or approved equivalent **and** wipe.
- F. Ensure connections are dry prior to connecting.

- G. Request second qualified individual confirm connections are free of grease, oil, or corrosion **and** that they are dry.
- H. **While** supporting to ensure connection alignment, connect piping/tubing.
- I. **If** connections are VCR, **then** hand tighten VCR connections **and** tighten an additional 1/8 turn using open end wrenches.
- J. **If** connections are other than VCR, **then** tighten connections using open end wrenches.
- K. **If** valve(s) is/are connected to piping/tubing, **then** ensure valve(s) is/are open.
- L. Repeat Steps 6.4.4.A through 6.4.4.K as necessary to install additional sections of rigid or flexible piping/tubing.

NOTE:

The intent of Steps 6.4.5 and 6.4.6 is to allow for additional piping/tubing to be connected beyond that connected to the V-104 connection. As with the steps above, a flexible pigtail is to be connected first as directed by Step 6.4.5, then additional rigid or flexible piping/tubing may be connected to the pigtail as directed in Step 6.4.6.

CAUTION:

**If** exposed to oil or water, **then** damage to fluorine connections, gaskets, or fittings may occur.

- 6.4.5 **If** other sections of rigid or flexible piping/tubing are to be passivated, **then** connect a pigtail to V-101 CONNECTION on ATB as follows:
  - A. Ensure neoprene or nitrile gloves are donned.
  - B. Remove connection plugs and caps, as applicable, on pigtail and connections, **and** store for later use, such that potential contamination is avoided.
  - C. Don new pair of neoprene or nitrile gloves.
  - D. **If** connections are VCR, **then** replace used metal gasket(s) with new metal gasket(s). Place used gasket(s) in appropriate waste container, as necessary.
  - E. Visually inspect connections for grease, oil, or corrosion. **If** grease, oil, or corrosion is present on connections, **then** clean by wetting a clean, lint-free rag with Vertrel cleaner or approved equivalent **and** wipe.
  - F. Ensure connections are dry prior to connecting.
  - G. Request second qualified individual confirm connections are free of grease, oil, or corrosion and that they are dry.
  - H. **While** supporting the ends to ensure connection alignment, connect pigtail.
  - I. **If** connections are VCR, **then** hand tighten VCR connections **and** tighten an additional 1/8 turn using open end wrenches.
  - J. **If** connections are other than VCR, **then** tighten connections using open end wrenches.

CAUTION:

**If** exposed to oil or water, **then** damage to fluorine connections, gaskets, or fittings may occur.

- 6.4.6** **If** other sections of rigid or flexible piping/tubing are to be passivated, **then** connect piping/tubing as directed by FLM to pigtail at V-101 CONNECTION as follows:
- A.** Ensure neoprene or nitrile gloves are donned.
  - B.** Remove connection plugs and caps, as applicable, on ends of piping/tubing to be connected, **and** store for later use, such that potential contamination is avoided.
  - C.** Don new pair of neoprene or nitrile gloves.
  - D.** **If** connections are VCR, **then** replace used metal gasket(s) with new metal gasket(s). Place used gasket(s) in appropriate waste container, as necessary.
  - E.** Visually inspect connections for grease, oil, or corrosion. **If** grease, oil, or corrosion is present on connections, **then** clean by wetting a clean, lint-free rag with Vertrel cleaner or approved equivalent **and** wipe.
  - F.** Ensure connections are dry prior to connecting.
  - G.** Request second qualified individual confirm connections are free of grease, oil, or corrosion and that they are dry.
  - H.** **While** supporting to ensure connection alignment, connect piping/tubing.
  - I.** **If** connections are VCR, **then** hand tighten VCR connections **and** tighten an additional 1/8 turn using open end wrenches.
  - J.** **If** connections are other than VCR, **then** tighten connections using open end wrenches.
  - K.** **If** valve(s) is/are connected to piping/tubing, **then** ensure valve(s) is/are open.
  - L.** Repeat Steps **6.4.6.A** through **6.4.6.K** as necessary to install additional sections of rigid or flexible piping/tubing.

NOTE:

The intent of Steps **6.4.7** and **6.4.8** is to allow for additional piping/tubing to be connected beyond that connected to the V-104 and V-101 connection. As with the steps above, a flexible pigtail is to be connected first as directed by Step **6.4.7**, then additional rigid or flexible piping/tubing may be connected to the pigtail as directed in Step **6.4.8**.

CAUTION:

**If** exposed to oil or water, **then** damage to fluorine connections, gaskets, or fittings may occur.

- 6.4.7** **If** other sections of rigid or flexible piping/tubing are to be passivated, **then** connect a pigtail to V-102 CONNECTION on ATB as follows:
- A.** Ensure neoprene or nitrile gloves are donned.

- B. Remove connection plugs and caps, as applicable, on pigtail and connections, **and** store for later use such that potential contamination is avoided.
- C. Don new pair of neoprene or nitrile gloves.
- D. **If** connections are VCR, **then** replace used metal gasket(s) with new metal gasket(s). Place used gasket(s) in appropriate waste container, as necessary.
- E. Visually inspect connections for grease, oil, or corrosion. **If** grease, oil, or corrosion is present on connections, **then** clean by wetting a clean, lint-free rag with Vertrel cleaner or approved equivalent **and** wipe.
- F. Ensure connections are dry prior to connecting.
- G. Request second qualified individual confirm connections are free of grease, oil, or corrosion and that they are dry.
- H. **While** supporting the ends to ensure connection alignment, connect pigtail.
- I. **If** connections are VCR, **then** hand tighten VCR connections **and** tighten an additional 1/8 turn using open end wrenches.
- J. **If** connections are other than VCR, **then** tighten connections using open end wrenches.

CAUTION:

**If** exposed to oil or water, **then** damage to fluorine connections, gaskets, or fittings may occur.

- 6.4.8 **If** other sections of rigid or flexible piping/tubing are to be passivated, **then** connect piping/tubing as directed by FLM to pigtail at V-102 CONNECTION as follows:
- A. Ensure neoprene or nitrile gloves are donned.
  - B. Remove connection plugs and caps, as applicable, on ends of piping/tubing to be connected, **and** store for later use such that potential contamination is avoided.
  - C. Don new pair of neoprene or nitrile gloves.
  - D. **If** connections are VCR, **then** replace used metal gasket(s) with new metal gasket(s). Place used gasket(s) in appropriate waste container, as necessary.
  - E. Visually inspect connections for grease, oil, or corrosion. **If** grease, oil, or corrosion is present on connections, **then** clean by wetting a clean, lint-free rag with Vertrel cleaner or approved equivalent **and** wipe.
  - F. Ensure connections are dry prior to connecting.
  - G. Request second qualified individual confirm connections are free of grease, oil, or corrosion and that they are dry.
  - H. Connect piping/tubing **while** supporting to ensure connection alignment.
  - I. **If** connections are VCR, **then** hand tighten VCR connections **and** tighten an additional 1/8 turn using open end wrenches.

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- J.** If connections are other than VCR, **then** tighten connections using open end wrenches.
- K.** If valve(s) is/are connected to piping/tubing, **then** ensure valve(s) is/are open.
- L.** Repeat Steps **6.4.8.A** through **6.4.8.K** as necessary to install additional sections of rigid or flexible piping/tubing.

**NOTE:**

Appendixes B through E may be used for reference during PCTC equipment lineup for passivation.

With the exception of an NTC, a typical conditioning plan for PCTC component(s) passivation should include charging equipment with **10% F<sub>2</sub>** at ambient temperature and **8.0 psia for 2 hours**, followed by **20% F<sub>2</sub>** at ambient temperature and **8.0 psia for 2 hours**. When passivating a NTC, the following four conditioning sessions are typically required: **10% F<sub>2</sub>** at ambient temperature and **8.0 psia for 2 hours**, followed by **20% F<sub>2</sub>** at ambient temperature and **8.0 psia for 2 hours**, followed by **20% F<sub>2</sub>** at **250°F** and **6.0 psia for 2 hours**, and finally charging with **20% F<sub>2</sub>** at **650°F** and **4.0 psia for up to 6 hours**. The successful completion of each conditioning session is contingent upon meeting the acceptance criteria detailed in the body of the procedure. Acceptance criteria is based on F<sub>2</sub> consumption rates and the resulting system pressure changes. A satisfactory leak rate on PCTC component(s) is also required following each conditioning session.

Section **6.5** is to be completed at an ambient temperature **greater than or equal to 70°F**. If outside temperature is **less than 70°F**, **then** the C-410-K canopy curtains may be closed as directed in Step **6.1.1** and portable heaters used in the area to raise the ambient temperature around the PCTC equipment.

**6.5 Passivating PCTC Components with 10% F<sub>2</sub> at Ambient Temperature**

**Facility Operations Personnel**

- 6.5.1** Ensure Section **6.1** has been completed.

**NOTE:**

ATB and NTC piping/components should be at surrounding temperatures and therefore are an indication of ambient temperature.

- 6.5.2** Ensure C-410-K canopy area ambient temperature is **greater than or equal to 70°F** as measured on the following PCTC temperature indicators:
  - Process Gas Cooler Supply
  - Process Gas Cooler Outlet
  - Oven air temperature, if connected
- 6.5.3** Close NPV-9.
- 6.5.4** If an NTC is connected for passivation, **then** line up NTC according to NTC Lineup section of Appendix G, *PCTC Component Passivation Lineup*.
- 6.5.5** Line up ATB according to ATB Lineup section of Appendix G.

- 6.5.6** Perform the following to obtain a minimum of **20** doubling purges of PCTC components:
- A.** Perform the following to start the jet:
    - 1.** Open AV-1
    - 2.** Position HS-91A to ON to open HY-91
  - B.** Open the following valves:
    - FVV-7A
    - FVV-7B
  - C.** Slowly open IMIV **until** pressure has stabilized on PIT-04 on ATB, **then** close the following valves:
    - FVV-7A
    - FVV-7B
  - D.** Slowly open NPV-9 **until** pressure is **between 16.0 and 18.0 psia** on PIT-04, **then** close NPV-9.
  - E.** Open the following valves:
    - FVV-7A
    - FVV-7B
  - F.** **When** pressure has stabilized on PIT-04 on ATB, close the following valves:
    - FVV-7A
    - FVV-7B
  - G.** Repeat Steps **6.5.6.D** through **6.5.6.F** until a minimum of 20 doubling purges is completed. (Appendix H, *Table of Doubling Purges*, may be used as an aid.)
- 6.5.7** Close IMIV.
- 6.5.8** Open NPV-9.
- 6.5.9** Ensure the following:
- A.** ATB purge pump is turned on using pump power switch.
  - B.** V-314 is open.
- 6.5.10** Open V-311 on ATB to evacuate ATB and connected piping/components.
- 6.5.11** Throttle V-311 as necessary to prevent overheating the purge pump.

NOTE:

Contaminants remaining in the hoses and piping (i.e., moisture) may affect the rate of evacuation, lowest achievable pressure for the system, and/or the system leak rate.

- 6.5.12** If indications exist that contaminants are in piping, **then** perform the following:
- A. Close V-311.
  - B. Monitor PIT-04 pressure reading for a **minimum of 10 minutes**.
  - C. If pressure rise on PIT-04 is **greater than 0.03 psi per 10 minutes**, **then** contact FLM/subject matter expert (SME) for further instructions.
  - D. Close NPV-9 **and** open IMIV.
  - E. Go to Step **6.5.6.D** to perform additional purge and evacuation cycles.
- 6.5.13** After a minimum of 10 minutes following PIT-04 reading less than or equal to 0.05 psia, close V-311.
- 6.5.14** If NTC is connected, **then** perform the following to leakrate pigtail between ATB and NTC:
- A. Close the following valves:
    - V-103
    - GL-02
  - B. Monitor pressure on PIT-02 on NTC or pressure on ATB HMI Cart Outlet Pres for a **minimum of 10 minutes**.
  - C. If pressure rise on PIT-02 or ATB HMI Cart Outlet Pres is **greater than 0.05 psi per 10 minutes**, **then** contact FLM/SME for further instructions.
  - D. Open the following valves:
    - V-103
    - GL-02
  - E. If pressure reading on PIT-04 is **greater than 0.05 psia**, **then** perform the following:
    - 1. Open V-311.
    - 2. **When** PIT-04 pressure reading is **less than or equal to 0.05 psia**, close V-311.
- 6.5.15** Monitor PIT-04 pressure reading for a **minimum of 10 minutes**.
- 6.5.16** If pressure rise on PIT-04 is **greater than 0.03 psi per 10 minutes**, **then** contact FLM/SME for further instructions.
- 6.5.17** Document successful leak rate on CP4-OP-0120-F01, *C-410-K Passivation of PCTC Component(s) Checklist*.

6.5.18 Slowly open IMIV **until** PIT-04 indicates **between 1.9 and 2.1 psia, then** close IMIV.

6.5.19 Perform the following to shut down the jet:

- A. Close AV-1.
- B. Position HS-91A to OFF to close HY-91.
- C. Text Deleted

6.5.20 Close the following valves:

- PEV-1
- PEV-2
- FFV-11

6.5.21 Confirm PV-104A is open. **If** PV-104A is **NOT** open, **then** contact FLM for further instructions.

6.5.22 Open PV-104B.

Chg.  
A

NOTE:

F<sub>2</sub> should be charged from the C-410-D storage tank with lowest system pressure. Digital PI, PI-104C, **may** be used to verify pressure increase on header.

6.5.23 Open the following valves to charge F<sub>2</sub> to FFV-11:

- FFV-12
- FFV-13
- FFV-14
- FFV-8
- FFV-9
- **If** charging from Storage Tank A, **then** FFV-5A
- **If** charging from Storage Tank B, **then** FFV-5B
- **If** charging from Storage Tank C, **then** FFV-5C

6.5.24 Close the following valves:

- **If** charging from Storage Tank A, **then** FFV-5A
- **If** charging from Storage Tank B, **then** FFV-5B
- **If** charging from Storage Tank C, **then** FFV-5C

**CAUTION:**

The introduction of F<sub>2</sub> into PCTC components could result in uncontrolled reactions taking place. Monitoring pressure and temperature indications closely for rapid, unexplained increases to detect these reactions and to stop the introduction of F<sub>2</sub> are critical to minimize the reaction's effects.

Charging components with F<sub>2</sub> should be completed slowly to allow accurate control of pressure. The C-410-K manifold pigtail is equipped with an IMIV to allow greater control during charging and evacuation.

6.5.25 Open FFV-11.

6.5.26 **While** monitoring for indications of an uncontrolled reaction, slowly open IMIV **until** PIT-04 indicates **between 5.9 and 6.1 psia**, **then** close IMIV.

- **If** indications of an uncontrolled reaction occur, **then** close IMIV **and** contact FLM for further instructions.
- **If 5.9 psia** on PIT-04 can **NOT** be achieved with IMIV fully open, **then** close IMIV **and** proceed to Step 6.5.27.

6.5.27 **If** PIT-04 pressure indication did **NOT** reach **5.9 psia** during performance of Step 6.5.26, **then** perform the following:

- A. Close FFV-11.
- B. Open the following valves to charge F<sub>2</sub> to FFV-11:
  - **If** charging from Storage Tank A, **then** FFV-5A
  - **If** charging from Storage Tank B, **then** FFV-5B
  - **If** charging from Storage Tank C, **then** FFV-5C
- C. Close the following valves:
  - **If** charging from Storage Tank A, **then** FFV-5A
  - **If** charging from Storage Tank B, **then** FFV-5B
  - **If** charging from Storage Tank C, **then** FFV-5C
- D. Go to Step 6.5.25.

6.5.28 Close the following valves:

- FFV-12
- FFV-13
- FFV-14
- FFV-8
- FFV-9

6.5.29 Open the following valves:

- PEV-1
- PEV-2

6.5.30 Slowly open IMIV **until** PIT-04 indicates **between 7.9 and 8.1 psia, then** close IMIV.

6.5.31 Record the following on CP4-OP-0120-F01, C-410-K Passivation of PCTC Component(s) Checklist:

- Start Time
- Starting System Temperature
- Starting System Pressure

6.5.32 Monitor PCTC component(s) for pressure and temperature increases.

6.5.33 **If** a sudden temperature increase greater than **10°F** or pressure increase greater than **0.5 psi** is observed, **then** perform the following:

- A. Notify FLM.
- B. Allow the PCTC component(s) conditions to stabilize.
- C. Contact FLM for further instructions.

**NOTE:**

Hot spots may be identified by localized higher temperatures in PCTC components that can **NOT** be explained by environmental conditions (e.g., placement of a heater, sunlight striking component, etc.) or system configuration.

6.5.34 Perform thermal imaging scans for hot spots on PCTC component(s) every **15 minutes** with Flir thermal imager or equivalent.

6.5.35 **If** hot spots were identified during scans performed with thermal imager, **then** notify FLM **immediately and** document in Comments section on CP4-OP-0120-F01, *C-410-K Passivation of PCTC Component(s) Checklist*.

6.5.36 **If** an NTC is connected for passivation, **then** perform the following:

- A. Monitor NTC oven temperature every **30 minutes**.

- B.** If oven temperature falls below **70°F**, then perform the following:
1. Ensure NTC oven doors are CLOSED.
  2. Depress the following pushbuttons on the NTC control panel:
    - CONTROL POWER ON
    - CIRCULATION FAN START
    - HEAT ENABLE
  3. Adjust PROCESS CONTROLLER on NTC to **between 70°F and 90°F**.
  4. Monitor NTC oven temperature to ensure temperature is rising.
  5. If NTC oven temperature is **NOT** rising, then perform the following:
    - a) Depress the following pushbuttons on the NTC control panel:
      - HEAT DISABLE
      - CIRCULATION FAN STOP
      - CONTROL POWER OFF
    - b) Position the following NTC disconnect switches to OFF position:
      - 480 VAC DISCONNECT SWITCH
      - PLC CONTROL PANEL DISCONNECT SWITCH
    - c) Contact FLM for further instructions.
  6. If necessary to open oven doors for thermal imaging scans, then perform the following:
    - a) Ensure leather gloves and long sleeved clothing are worn.
    - b) Open oven doors.
    - c) Obtain thermal imaging scan.
    - d) Close oven doors.

**C.** Monitor unit display for temperature data from probe locations.

**6.5.37** When 2 hours has elapsed from completion of Step **6.5.31**, then record the following on CP4-OP-0120-F01, *C-410-K Passivation of PCTC Component(s) Checklist*:

- End Time
- Ending System Temperature
- Ending System Pressure

**6.5.38** Perform the following to purge and evacuate PCTC components:

- A. Close NPV-9.
- B. Perform the following to start the jet:
  - 1. Open AV-1
  - 2. Position HS-91A to ON to open HY-91
- C. Open the following valves:
  - FVV-7A
  - FVV-7B

**CAUTION:**

Evacuating component(s) charged with F<sub>2</sub> should be completed slowly to allow F<sub>2</sub> to disperse to atmosphere and maintain F<sub>2</sub> concentrations below detectable levels. The C-410-K manifold pigtail is equipped with an IMIV to allow greater control during F<sub>2</sub> charging and evacuation.

- D. Slowly open IMIV **until** pressure has stabilized on PIT-04 on ATB, **then** close the following valves:
  - FVV-7A
  - FVV-7B
- E. Slowly open NPV-9 **until** pressure is **between 16.0 and 18.0 psia** on PIT-04, **then** close NPV-9.
- F. Open the following valves:
  - FVV-7A
  - FVV-7B
- G. **When** pressure has stabilized on PIT-04 on ATB, close the following valves:
  - FVV-7A
  - FVV-7B
- H. Repeat Steps **6.5.38.E** through **6.5.38.G** a minimum of two additional times.

**NOTE:**

Purge and evacuation cycles already completed may count toward those needed to achieve 20 doubling purges.

- I. **If** equipment will be disconnected following completion of this section, **then** repeat Steps **6.5.38.E** through **6.5.38.G** until an equivalent of 20 doubling purges is completed. (Appendix H, *Table of Doubling Purges*, may be used as an aid.)

**6.5.39** Close IMIV.

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- 6.5.40** Perform the following to shut down the jet:
- A.** Close AV-1.
  - B.** Position HS-91A to OFF to close HY-91
- 6.5.41** Open NPV-9.
- 6.5.42** Ensure the following:
- A.** ATB purge pump is turned on using pump power switch.
  - B.** V-314 is open.
- 6.5.43** Open V-311 on ATB to evacuate ATB and connected piping/components.
- 6.5.44** Throttle V-311 as necessary to prevent overheating the purge pump.
- 6.5.45** After a minimum of 10 minutes following PIT-04 reading less than or equal to 0.05 psia, then close V-311.
- 6.5.46** Monitor PIT-04 pressure reading for a **minimum of 10 minutes**.
- 6.5.47** **If** pressure rise on PIT-04 is **greater than 0.03 psi per 10 minutes**, **then** notify FLM for further instructions.
- 6.5.48** Document successful post-passivation leak rate on CP4-OP-0120-F01, *C-410-K Passivation of PCTC Component(s) Checklist*.
- 6.5.49** Review CP4-OP-0120-F01 with FLM/SME as follows:
- A.** **If** PCTC components system pressure dropped **greater than 0.5 psi** (not attributable to a drop in temperature) during the conditioning session, **then** go to Step **6.5.18** to re-perform passivation **unless** directed otherwise by FLM.
  - B.** **If** the PCTC system pressure remained within **0.5 psi** of the initial conditioning session pressure, **then** continue to Section **6.6**.

**NOTE:**

Section **6.6** is to be completed at an ambient temperature **greater than or equal to 70°F**. **If** outside temperature is **less than 70°F**, **then** the C-410-K canopy curtains may be closed as directed in Step **6.1.1** and portable heaters used in the area to raise the ambient temperature around the PCTC equipment.

**6.6 Passivating PCTC Components with 20% F<sub>2</sub> at Ambient Temperature**

**Facility Operations Personnel**

- 6.6.1** Ensure the following Sections have been completed:
- Section 6.1
  - Section 6.5

NOTE:

ATB and NTC piping/components should be at surrounding temperatures and therefore are an indication of ambient temperature.

- 6.6.2** Ensure C-410-K canopy area ambient temperature is **greater than or equal to 70°F** as measured on the following PCTC temperature indicators:
- ATB supply temperature
  - ATB cooler outlet temperature
  - NTC oven temperature
- 6.6.3** **If** no activities have been performed since the completion of Section **6.5** **and** pressure reading on PIT-04 on ATB is less than or equal to 0.05 psia, **then** go to Step **6.6.16**.
- 6.6.4** **If** an NTC is connected for passivation, **then** ensure NTC is lined up according to NTC Lineup section of Appendix G, *PCTC Component Passivation Lineup*.
- 6.6.5** Ensure ATB is lined up according to ATB Lineup section of Appendix G.
- 6.6.6** Close NPV-9.
- 6.6.7** Perform the following to start the jet:
- A.** Open AV-1.
  - B.** Position HS-91A to ON to open HY-91.
- 6.6.8** Open the following valves:
- FVV-7A
  - FVV-7B
- 6.6.9** Slowly open IMIV **until** pressure has stabilized on PIT-04 on ATB, **then** close the following valves:
- IMIV
  - FVV-7A
  - FVV-7B
- 6.6.10** Perform the following to shut down the jet:
- A.** Close AV-1.
  - B.** Position HS-91A to OFF to close HY-91.
- 6.6.11** Open NPV-9.
- 6.6.12** Ensure the following:
- A.** ATB purge pump is turned on using pump power switch.

**B.** V-314 is open.

**6.6.13** Open V-311 on ATB to evacuate ATB and connected piping/components.

**6.6.14** Throttle V-311 as necessary to prevent overheating the purge pump.

**6.6.15** After a minimum of 10 minutes following PIT-04 reading less than or equal to 0.05 psia, then close V-311.

**6.6.16** Close the following valves:

- PEV-1
- PEV-2
- FFV-11

**6.6.17** Confirm PV-104A is open. **If** PV-104A is closed, **then** contact FLM for further instructions.

**6.6.18** Ensure PV-104B is open.

**NOTE:**

F<sub>2</sub> should be charged from the C-410-D storage tank with lowest system pressure.

**6.6.19** Open the following valves to charge F<sub>2</sub> to FFV-11:

- FFV-12
- FFV-13
- FFV-14
- FFV-8
- FFV-9
- **If** charging from Storage Tank A, **then** FFV-5A
- **If** charging from Storage Tank B, **then** FFV-5B
- **If** charging from Storage Tank C, **then** FFV-5C

**6.6.20** Close the following valves:

- **If** charging from Storage Tank A, **then** FFV-5A
- **If** charging from Storage Tank B, **then** FFV-5B
- **If** charging from Storage Tank C, **then** FFV-5C

CAUTION:

The introduction of F<sub>2</sub> into PCTC components could result in uncontrolled reactions taking place. Monitoring pressure and temperature indications closely for rapid, unexplained increases to detect these reactions and to stop the introduction of F<sub>2</sub> are critical to minimize the reaction's effects.

Charging components with F<sub>2</sub> should be completed slowly to allow accurate control of pressure. The C-410-K manifold pigtail is equipped with an IMIV to allow greater control during charging and evacuation.

**6.6.21** Open FFV-11.

**6.6.22** While monitoring for indications of an uncontrolled reaction, slowly open IMIV until PIT-04 indicates between **7.9** and **8.1 psia**, then close IMIV.

- If indications of an uncontrolled reaction occur, then close IMIV and contact FLM for further instructions.
- If **7.9 psia** on PIT-04 can **NOT** be achieved with IMIV fully open, then close IMIV and proceed to Step **6.6.23**.

**6.6.23** If PIT-04 pressure indication did **NOT** reach **7.9 psia** during performance of Step **6.6.22**, then perform the following:

**A.** Close FFV-11.

**B.** Open the following valves to charge F<sub>2</sub> to FFV-11:

- If charging from Storage Tank A, then FFV-5A
- If charging from Storage Tank B, then FFV-5B
- If charging from Storage Tank C, then FFV-5C

**C.** Close the following valves:

- If charging from Storage Tank A, then FFV-5A
- If charging from Storage Tank B, then FFV-5B
- If charging from Storage Tank C, then FFV-5C

**D.** Go to Step **6.6.21**.

**6.6.24** Close the following valves:

- FFV-12
- FFV-13
- FFV-14
- FFV-8
- FFV-9

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**6.6.25** Open the following valves:

- PEV-1
- PEV-2

**6.6.26** Record the following on CP4-OP-0120-F01, *C-410-K Passivation of PCTC Component(s) Checklist*:

- Start Time
- Starting System Temperature
- Starting System Pressure

**6.6.27** Monitor PCTC component(s) for pressure and temperature increases.

**6.6.28** If a sudden temperature increase greater than **10°F** or pressure increase greater than **0.5 psi** is observed, **then** perform the following:

- A. Notify FLM.
- B. Allow the PCTC component(s) conditions to stabilize.
- C. Contact FLM for further instructions.

**NOTE:**

Hot spots may be identified by localized higher temperatures in PCTC components that can **NOT** be explained by environmental conditions (e.g., placement of a heater, sunlight striking component, etc.) or system configuration.

**6.6.29** Perform thermal imaging scans for hot spots on PCTC component(s) every **15 minutes** with Flir thermal imager or equivalent.

**6.6.30** If hot spots were identified during scans performed with thermal imager, **then** notify FLM **immediately and** document in Comments section on CP4-OP-0120-F01, *C-410-K Passivation of PCTC Component(s) Checklist*.

**6.6.31** If an NTC is connected for passivation, **then** perform the following:

- A. Monitor NTC oven temperature every **30 minutes**.
- B. If oven temperature falls below **70°F**, **then** perform the following:
  1. Ensure NTC oven doors are CLOSED.
  2. Depress the following pushbuttons on the NTC control panel:
    - CONTROL POWER ON
    - CIRCULATION FAN START
    - HEAT ENABLE
  3. Adjust PROCESS CONTROLLER on NTC to **between 70°F and 90°F**.

4. Monitor NTC oven temperature to ensure temperature is rising.
5. **If** NTC oven temperature is **NOT** rising, **then** perform the following:
  - a) Depress the following pushbuttons on the NTC control panel:
    - HEAT DISABLE
    - CIRCULATION FAN STOP
    - CONTROL POWER OFF
  - b) Position the following NTC disconnect switches to OFF position:
    - 480 VAC DISCONNECT SWITCH
    - PLC CONTROL PANEL DISCONNECT SWITCH
  - c) Contact FLM for further instructions.
6. **If** necessary to open oven doors for thermal imaging scans, **then** perform the following:
  - a) Ensure leather gloves and long sleeved clothing is worn.
  - b) Open oven doors.
  - c) Obtain thermal imaging scan.
  - d) Close oven doors.

C. Monitor unit display for temperature data from probe locations.

**6.6.32** **When 2 hours** has elapsed since completion of Step **6.6.26**, **then** record the following on CP4-OP-0120-F01, *C-410-K Passivation of PCTC Component(s) Checklist*:

- End Time
- Ending System Temperature
- Ending System Pressure

**6.6.33** Perform the following to purge and evacuate PCTC components:

**A.** Close NPV-9.

**B.** Perform the following to start the jet:

1. Open AV-1
2. Position HS-91A to ON to open HY-91

C. Open the following valves:

- FVV-7A
- FVV-7B

**CAUTION:**

Evacuating component(s) charged with F<sub>2</sub> should be completed slowly to allow F<sub>2</sub> to disperse to atmosphere and maintain F<sub>2</sub> concentrations below detectable levels. The C-410-K manifold pigtail is equipped with an IMIV to allow greater control during F<sub>2</sub> charging and evacuation.

D. Slowly open IMIV **until** pressure has stabilized on PIT-04 on ATB, **then** close the following valves:

- FVV-7A
- FVV-7B

E. Slowly open NPV-9 **until** pressure is **between 16.0 and 18.0 psia** on PIT-04, **then** close NPV-9.

F. Open the following valves:

- FVV-7A
- FVV-7B

G. **When** pressure has stabilized on PIT-04 on ATB, **then** close the following valves:

- FVV-7A
- FVV-7B

H. Repeat Steps 6.6.33.E through 6.6.33.G a minimum of two additional times.

**NOTE:**

Purge and evacuation cycles already completed may count toward those needed to achieve 20 doubling purges.

I. If equipment will be disconnected following completion of this section, then repeat Steps **6.6.33.E** through **6.6.33.G** until an equivalent of 20 doubling purges is completed. (Appendix H, *Table of Doubling Purges*, may be used as an aid.)

**6.6.34** Close IMIV.

**6.6.35** Perform the following to shut down the jet:

A. Close AV-1.

B. Position HS-91A to OFF to close HY-91

**6.6.36** Open NPV-9.

**6.6.37** Ensure the following:

A. ATB purge pump is turned on using pump power switch.

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**B.** V-314 is open.

**6.6.38** Open V-311 on ATB to evacuate ATB and connected piping/components.

**6.6.39** Throttle V-311 as necessary to prevent overheating the purge pump.

**6.6.40** After a minimum of 10 minutes following PIT-04 reading less than or equal to 0.05 psia, then close V-311.

**6.6.41** Monitor PIT-04 pressure reading for a **minimum of 10 minutes**.

**6.6.42** **If** pressure rise on PIT-04 is **greater than 0.03 psi per 10 minutes**, **then** contact FLM for further instructions.

**6.6.43** Document successful post-passivation leak rate on CP4-OP-0120-F01, *C-410-K Passivation of PCTC Component(s) Checklist*.

**6.6.44** Review CP4-OP-0120-F01 with FLM/SME as follows:

**A.** **If** PCTC components system pressure dropped **greater than 0.5 psi** (not attributable to a drop in temperature) during the conditioning session, **then** re-perform Section **6.6** **unless** directed otherwise by FLM.

**B.** **If** the PCTC system pressure remained within **0.5 psi** of the initial conditioning session pressure, **then** perform the following:

**1.** **If** an NTC is connected for passivation, **then** perform the following:

**a)** **If** additional piping/tubing is connected to V-101 and/or V-104 connections on ATB **and** it is desired to disconnect them, **then** perform Section **6.9** to disconnect piping/tubing.

**b)** Continue to Section 6.7.

**2.** **If** an NTC is **NOT** connected, **then** go to Section **6.9**.

## **6.7 Passivating NTC with 20% F<sub>2</sub> at 250°F**

### **Facility Operations Personnel**

**6.7.1** Ensure the following Sections have been completed:

- Section 6.1
- Section 6.5
- Section 6.6

**6.7.2** **If** no activities have been performed since the completion of Section **6.6** **and** pressure reading on PIT-04 on ATB is less than or equal to 0.05 psia, **then** go to Step **6.7.15**.

**6.7.3** Ensure NTC is lined up according to NTC Lineup section of Appendix G, *PCTC Component Passivation Lineup*.

**6.7.4** Ensure ATB is lined up according to ATB Lineup section of Appendix G.

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- 6.7.5** Close NPV-9.
- 6.7.6** Perform the following to start the jet:
- A.** Open AV-1
  - B.** Position HS-91A to ON to open HY-91
- 6.7.7** Open the following valves:
- FVV-7A
  - FVV-7B
- 6.7.8** Slowly open IMIV **until** pressure has stabilized on PIT-04 on ATB, **then** close the following valves:
- IMIV
  - FVV-7A
  - FVV-7B
- 6.7.9** Perform the following to shut down the jet:
- A.** Close AV-1.
  - B.** Position HS-91A to OFF to close HY-91
- 6.7.10** Open NPV-9.
- 6.7.11** Ensure the following:
- A.** ATB purge pump is turned on using pump power switch.
  - B.** V-314 is open.
- 6.7.12** Open V-311 on ATB to evacuate ATB and connected piping/components.
- 6.7.13** Throttle V-311 as necessary to prevent overheating the purge pump.
- 6.7.14** After a minimum of 10 minutes following PIT-04 reading less than or equal to 0.05 psia, then close V-311.
- 6.7.15** Close the following valves:
- PEV-1
  - PEV-2
  - FFV-11

6.7.16 Close the following valves:

- GL-02
- V-103

6.7.17 Confirm PV-104A is open. **If** PV-104A is **NOT** open, **then** contact FLM for further instructions.

6.7.18 Ensure PV-104B is open.

NOTE:

F<sub>2</sub> should be charged from the C-410-D storage tank with lowest system pressure. Digital PI, PI-104C, **may** be used to verify pressure increase on header.

6.7.19 Open the following valves to charge F<sub>2</sub> to FFV-11:

- FFV-12
- FFV-13
- FFV-14
- FFV-8
- FFV-9
- **If** charging from Storage Tank A, **then** FFV-5A
- **If** charging from Storage Tank B, **then** FFV-5B
- **If** charging from Storage Tank C, **then** FFV-5C

6.7.20 Close the following valves:

- **If** charging from Storage Tank A, **then** FFV-5A
- **If** charging from Storage Tank B, **then** FFV-5B
- **If** charging from Storage Tank C, **then** FFV-5C

CAUTION:

The introduction of F<sub>2</sub> into PCTC components could result in uncontrolled reactions taking place. Monitoring pressure and temperature indications closely for rapid, unexplained increases to detect these reactions and to stop the introduction of F<sub>2</sub> are critical to minimize the reaction's effects.

Charging components with F<sub>2</sub> should be completed slowly to allow accurate control of pressure. The C-410-K manifold pigtail is equipped with an IMIV to allow greater control during charging and evacuation.

6.7.21 Open FFV-11.

- 6.7.22** While monitoring for indications of an uncontrolled reaction, slowly open IMIV **until** NTC pressure indicates **between 5.9 and 6.1 psia, then** close IMIV.
- **If** indications of an uncontrolled reaction occur, **then** close IMIV **and** contact FLM for further instructions.
  - **If 5.9 psia** can **NOT** be achieved with IMIV fully open, **then** close IMIV **and** proceed to Step **6.7.23**.
- 6.7.23** **If** NTC pressure indication did **NOT** reach **5.9 psia** during performance of Step **6.7.22**, **then** perform the following:
- A. Close FFV-11.
- B. Open the following valves to charge F<sub>2</sub> to FFV-11:
- **If** charging from Storage Tank A, **then** FFV-5A
  - **If** charging from Storage Tank B, **then** FFV-5B
  - **If** charging from Storage Tank C, **then** FFV-5C
- C. Close the following valves:
- **If** charging from Storage Tank A, **then** FFV-5A
  - **If** charging from Storage Tank B, **then** FFV-5B
  - **If** charging from Storage Tank C, **then** FFV-5C
- D. Go to Step 6.7.21.
- 6.7.24** Close the following valves:
- FFV-12
  - FFV-13
  - FFV-14
  - FFV-8
  - FFV-9
- 6.7.25** Open the following valves:
- PEV-1
  - PEV-2
- 6.7.26** Monitor PCTC component(s) for pressure and temperature increases.
- 6.7.27** **If** a sudden temperature increase greater than **10°F** or pressure increase greater than **0.5 psi** is observed, **then** perform the following:
- A. Notify FLM.

- B. Allow the PCTC component(s) conditions to stabilize.
- C. Contact FLM for further instructions.

**6.7.28** Heat NTC oven as follows:

- A. Ensure NTC oven doors are CLOSED.
- B. Adjust PROCESS CONTROLLER on NTC to **250°F**.
- C. Depress the following pushbuttons on the NTC control panel:
  - CONTROL POWER ON
  - CIRCULATION FAN START
  - HEAT ENABLE
- D. Monitor NTC oven temperature to ensure temperature is rising.
- E. **If** NTC oven temperature is **NOT** rising, **then** perform the following:
  - 1. Depress the following pushbuttons on the NTC control panel:
    - HEAT DISABLE
    - CIRCULATION FAN STOP
    - CONTROL POWER OFF
  - 2. Position the following NTC disconnect switches to OFF:
    - 480 VAC DISCONNECT SWITCH
    - PLC CONTROL PANEL DISCONNECT SWITCH
  - 3. Contact FLM for further instructions.

**6.7.29** Monitor the following at least every **30 minutes**:

- ATB supply temperature
- ATB cooler outlet temperature
- NTC oven temperature
- ATB display for NTC temperature data from probe locations

**6.7.30** **If** ATB supply or cooler outlet temperatures are **greater than or equal to 100°F**, **then** open **and** close DRY AIR PURGE BLOCK #1 as necessary to maintain temperatures **less than 100°F**.

**6.7.31** **If** ATB supply or cooler outlet temperatures exceed **130°F**, **then** perform the following:

- A. Depress the HEAT DISABLE pushbutton on the NTC control panel.

**B.** When NTC oven temperature is **less than 200°F**, then depress the following pushbuttons on the NTC control panel:

- CIRCULATION FAN STOP
- CONTROL POWER OFF

**C.** Contact FLM for further guidance.

**6.7.32** When oven temperature reaches setpoint (**250°F**), then wait an additional **2 hours** to allow traps to heat through.

**6.7.33** When additional **2 hour** wait time has elapsed, then record the following on CP4-OP-0120-F01, *C-410-K Passivation of PCTC Component(s) Checklist*.

- Start Time
- Starting System Temperature
- Starting System Pressure

**6.7.34** When **2 hours** has elapsed since completion of Step **6.7.33**, then record the following on CP4-OP-0120-F01, *C-410-K Passivation of PCTC Component(s) Checklist*:

- End Time
- Ending System Temperature
- Ending System Pressure

NOTE:

NTC oven doors may be opened to aid in cool down.

**6.7.35** Depress HEAT DISABLE pushbutton on the NTC control panel to turn off oven heater.

**6.7.36** When NTC oven temperature is **less than 200°F**, then depress the following pushbuttons on the NTC control panel:

- CIRCULATION FAN STOP
- CONTROL POWER OFF

**6.7.37** Perform the following to purge and evacuate PCTC components:

**A.** Close NPV-9.

**B.** Perform the following to start the jet:

1. Open AV-1
2. Position HS-91A to ON to open HY-91

C. Open the following valves:

- FVV-7A
- FVV-7B

**CAUTION:**

Evacuating component(s) charged with F<sub>2</sub> should be completed slowly to allow F<sub>2</sub> to disperse to atmosphere and maintain F<sub>2</sub> concentrations below detectable levels. The C-410-K manifold pigtail is equipped with an IMIV to allow greater control during F<sub>2</sub> charging and evacuation.

D. Slowly open IMIV **until** NTC pressure has stabilized, **then** close the following valves:

- FVV-7A
- FVV-7B

E. Slowly open NPV-9 **until** NTC pressure is **between 16.0 and 18.0 psia**, **then** close NPV-9.

F. Open the following valves:

- FVV-7A
- FVV-7B

G. **When** NTC pressure has stabilized, **then** close the following valves:

- FVV-7A
- FVV-7B

H. Repeat Steps **6.7.37.E** through **6.7.37.G** a minimum of two additional times.

**NOTE:**

Purge and evacuation cycles already completed may count toward those needed to achieve 20 doubling purges.

I. **If** equipment will be disconnected following completion of this section, **then** repeat Steps **6.7.37.E** through **6.7.37.G** until an equivalent of 20 doubling purges is completed. (Appendix H, *Table of Doubling Purges*, may be used as an aid.)

**6.7.38** Close IMIV.

**6.7.39** Perform the following to shut down the jet:

A. Close AV-1.

B. Position HS-91A to OFF to close HY-91

**6.7.40** Open NPV-9.

**6.7.41** Ensure NTC oven temperature is **less than 130°F**.

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**6.7.42** Open the following valves:

- GL-02
- V-103

**6.7.43** Ensure the following:

- A.** ATB purge pump is turned on using pump power switch.
- B.** V-314 is open.

**6.7.44** Open V-311 on ATB to evacuate ATB and connected piping/components.

**6.7.45** Throttle V-311 as necessary to prevent overheating the purge pump.

**6.7.46** After a minimum of 10 minutes following PIT-04 reading less than or equal to 0.05 psia, then close V-311.

**6.7.47** Monitor PIT-04 pressure reading for a **minimum of 10 minutes**.

**6.7.48** **If** pressure rise on PIT-04 is **greater than 0.03 psi per 10 minutes**, **then** contact FLM for further instructions.

**6.7.49** Document successful post-passivation leak rate on CP4-OP-0120-F01, *C-410-K Passivation of PCTC Component(s) Checklist*.

**6.7.50** Review CP4-OP-0120-F01 with FLM/SME as follows:

- A.** **If** NTC system pressure dropped **greater than 0.5 psi** (not attributable to a drop in temperature) during the conditioning session, **then** re-perform Section **6.7 unless** directed otherwise by FLM.
- B.** **If** NTC system pressure remained within **0.5 psi** of the initial conditioning session pressure, **then** continue to Section **6.8**.

## **6.8 Passivating NTC with 20% F<sub>2</sub> at 650°F**

### **Facility Operations Personnel**

**6.8.1** Ensure the following Sections have been completed:

- Section 6.1
- Section 6.5
- Section 6.6
- Section 6.7

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- 6.8.2** If 480 VOLTS source is portable generator, **then** perform the following:
- A.** Position the following NTC disconnect switches to OFF:
    - 480 VAC DISCONNECT SWITCH
    - PLC CONTROL PANEL DISCONNECT SWITCH
  - B.** Position 480 VOLTS supply disconnect or breaker to OPEN/OFF.
  - C.** Refuel generator.
  - D.** Ensure generator is running.
  - E.** Position 480 VOLTS supply disconnect or breaker to CLOSED/ON.
  - F.** Position the following NTC disconnect switches to ON position:
    - 480 VAC DISCONNECT SWITCH
    - PLC CONTROL PANEL DISCONNECT SWITCH
- 6.8.3** If no activities have been performed since the completion of Section **6.7** and pressure reading on PIT-04 on ATB is less than or equal to 0.05 psia, **then** go to Step **6.8.16**.
- 6.8.4** Ensure NTC is lined up according to NTC Lineup section of Appendix G, *PCTC Component Passivation Lineup*.
- 6.8.5** Ensure ATB is lined up according to ATB Lineup section of Appendix G.
- 6.8.6** Close NPV-9.
- 6.8.7** Perform the following to start the jet:
- A.** Open AV-1
  - B.** Position HS-91A to ON to open HY-91
- 6.8.8** Open the following valves:
- FVV-7A
  - FVV-7B
- 6.8.9** Slowly open IMIV **until** pressure has stabilized on PIT-04, **then** close the following valves:
- IMIV
  - FVV-7A
  - FVV-7B
- 6.8.10** Perform the following to shut down the jet:
- A.** Close AV-1.

**B.** Position HS-91A to OFF to close HY-91

**6.8.11** Open NPV-9.

**6.8.12** Ensure the following:

**A.** ATB purge pump is turned on using pump power switch.

**B.** V-314 is open.

**6.8.13** Open V-311 on ATB to evacuate ATB and connected piping/components.

**6.8.14** Throttle V-311 as necessary to prevent overheating the purge pump.

**6.8.15** After a minimum of 10 minutes following PIT-04 reading less than or equal to 0.05 psia, close V-311.

**6.8.16** Close the following valves:

- PEV-1
- PEV-2
- FFV-11

**6.8.17** Close the following valves:

- GL-02
- V-103
- Confirm PV-104A is open. **If** PV-104A is **NOT** open, **then** contact FLM for further instructions.

**6.8.18** Ensure PV-104B is open.

**NOTE:**

F<sub>2</sub> should be charged from the C-410-D storage tank with lowest system pressure. Digital PI, PI-104C, **may** be used to verify pressure increase on header.

**6.8.19** Open the following valves to charge F<sub>2</sub> to FFV-11:

- FFV-12
- FFV-13
- FFV-14
- FFV-8
- FFV-9
- **If** charging from Storage Tank A, **then** FFV-5A
- **If** charging from Storage Tank B, **then** FFV-5B
- **If** charging from Storage Tank C, **then** FFV-5C

6.8.20 Close the following valves:

- **If** charging from Storage Tank A, **then** FFV-5A
- **If** charging from Storage Tank B, **then** FFV-5B
- **If** charging from Storage Tank C, **then** FFV-5C

**CAUTION:**

The introduction of F<sub>2</sub> into PCTC components could result in uncontrolled reactions taking place. Monitoring pressure and temperature indications closely for rapid, unexplained increases to detect these reactions and to stop the introduction of F<sub>2</sub> are critical to minimize the reaction's effects.

Charging components with F<sub>2</sub> should be completed slowly to allow accurate control of pressure. The C-410-K manifold pigtail is equipped with an IMIV to allow greater control during charging and evacuation.

6.8.21 Open FFV-11.

6.8.22 **While** monitoring for indications of an uncontrolled reaction, slowly open IMIV **until** NTC pressure indicates **between 3.9 and 4.1 psia, then** close IMIV:

- **If** indications of an uncontrolled reaction occur, **then** close IMIV **and** contact FLM for further instructions.
- **If 3.9 psia** on NTC can **NOT** be achieved with IMIV fully open, **then** close IMIV **and** proceed to Step **6.8.23**.

6.8.23 **If** NTC pressure did **NOT** reach **3.9 psia** during performance of Step **6.8.22, then** perform the following:

- A. Close FFV-11.
- B. Open the following valves to charge F<sub>2</sub> to FFV-11:
  - **If** charging from Storage Tank A, **then** FFV-5A
  - **If** charging from Storage Tank B, **then** FFV-5B
  - **If** charging from Storage Tank C, **then** FFV-5C
- C. Close the following valves:
  - **If** charging from Storage Tank A, **then** FFV-5A
  - **If** charging from Storage Tank B, **then** FFV-5B
  - **If** charging from Storage Tank C, **then** FFV-5C
- D. Go to Step 6.8.21.

**6.8.24** Close the following valves:

- FFV-12
- FFV-13
- FFV-14
- FFV-8
- FFV-9

**6.8.25** Open the following valves:

- PEV-1
- PEV-2

**6.8.26** Monitor PCTC component(s) for pressure and temperature increases.

**6.8.27** If a sudden temperature increase greater than **10°F** or pressure increase **greater than 0.5 psi** is observed, **then** perform the following:

- A. Notify FLM.
- B. Allow the PCTC component(s) conditions to stabilize.
- C. Contact FLM for further instructions.

**6.8.28** Heat NTC oven as follows:

- A. Ensure NTC oven doors are CLOSED.
- B. Adjust PROCESS CONTROLLER on NTC to **650°F**.
- C. Depress the following pushbuttons on the NTC control panel:
  - CONTROL POWER ON
  - CIRCULATION FAN START
  - HEAT ENABLE
- D. Monitor NTC oven temperature to ensure temperature is rising.
- E. If NTC oven temperature is **NOT** rising, **then** perform the following:
  1. Depress the following pushbuttons on the NTC control panel:
    - HEAT DISABLE
    - CIRCULATION FAN STOP
    - CONTROL POWER OFF

2. Position the following NTC disconnect switches to OFF:
  - 480 VAC DISCONNECT SWITCH
  - PLC CONTROL PANEL DISCONNECT SWITCH
3. Contact FLM for further instructions.

**6.8.29** Monitor the following at least every **30 minutes**:

- ATB supply temperature
- ATB cooler outlet temperature
- NTC oven temperature
- ATB display for NTC temperature data from probe locations

**6.8.30** If ATB supply or cooler outlet temperatures are **greater than or equal to 100°F**, then open and close DRY AIR PURGE BLOCK #1 as necessary to maintain temperatures **less than 100°F**.

**6.8.31** If ATB supply or cooler outlet temperatures exceed **130°F**, then perform the following:

- A. Depress the HEAT DISABLE pushbutton on the NTC control panel.
- B. **When** NTC oven temperature is **less than 200°F**, then depress the following pushbuttons on the NTC control panel:
  - CIRCULATION FAN STOP
  - CONTROL POWER OFF
- C. Contact FLM for further guidance.

**6.8.32** **When** oven temperature is between **600°F** and **650°F**, then wait an additional **2 hours** to allow traps to heat through.

**6.8.33** **When** additional **2 hour** wait time has elapsed, then record the following on CP4-OP-0120-F01, *C-410-K Passivation of PCTC Component(s) Checklist*.

- Start Time
- Starting System Temperature
- Starting System Pressure

**6.8.34** If at any time during a **6-hour** heating cycle the system pressure remains within a **0.25 psi** range during any continuous **2-hour** increment, **then** perform the following:

**A.** Record the following on CP4-OP-0120-F01, C-410-K Passivation of NTC System Component(s) Checklist:

- End Time
- Ending System Temperature
- Ending System Pressure

**B.** Go to Step **6.8.36**.

**6.8.35** When **6 hours** have elapsed since the completion of Step **6.8.33**, **then** record the following on CP4-OP-0120-F01, *C-410-K Passivation of NTC System Component(s) Checklist*:

- End Time
- Ending System Temperature
- Ending System Pressure

NOTE:

NTC oven doors may be opened to aid in cool down **when** oven temperatures are **less than 250°F**.

**6.8.36** Notify FLM/SME of session results.

**6.8.37** Depress HEAT DISABLE pushbutton on the NTC control panel to turn off oven heater.

**6.8.38** When NTC oven temperature is **less than 200°F**, depress the following pushbuttons on the NTC control panel:

- CIRCULATION FAN STOP
- CONTROL POWER OFF

**6.8.39** Perform the following to purge and evacuate PCTC components:

**A.** Close NPV-9.

**B.** Perform the following to start the jet:

1. Open AV-1
2. Position HS-91A to ON to open HY-91

**C.** Open the following valves:

- FVV-7A
- FVV-7B

CAUTION:

Evacuating component(s) charged with F<sub>2</sub> should be completed slowly to allow F<sub>2</sub> to disperse to atmosphere and maintain F<sub>2</sub> concentrations below detectable levels. The C-410-K manifold pigtail is equipped with an IMIV to allow greater control during F<sub>2</sub> charging and evacuation.

- D. Slowly open IMIV **until** NTC pressure has stabilized, **then** close the following valves:
  - FVV-7A
  - FVV-7B
- E. Slowly open NPV-9 **until** NTC pressure is **between 16.0 and 18.0 psia**, **then** close NPV-9.
- F. Open the following valves:
  - FVV-7A
  - FVV-7B
- G. **When** NTC pressure has stabilized, close the following valves:
  - FVV-7A
  - FVV-7B
- H. Repeat Steps **6.8.39.E** through **6.8.39.G** until an equivalent of 20 doubling purges is completed. (Appendix H, *Table of Doubling Purges*, may be used as an aid.)

**6.8.40** Close IMIV.

**6.8.41** Perform the following to shut down the jet:

- A. Close AV-1.
- B. Position HS-91A to OFF to close HY-91

**6.8.42** Open NPV-9.

**6.8.43** Ensure NTC oven temperature is **less than 130°F**.

**6.8.44** Open the following valves:

- GL-02
- V-103

**6.8.45** Ensure the following:

- A. ATB purge pump is turned on using pump power switch.
- B. V-314 is open.

**6.8.46** Open V-311 on ATB to evacuate ATB and connected piping/components.

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- 6.8.47 Throttle V-311 as necessary to prevent overheating the purge pump.
- 6.8.48 After a minimum of 10 minutes following PIT-04 reading less than or equal to 0.05 psia, close V-311.
- 6.8.49 Monitor PIT-04 pressure reading for a **minimum of 10 minutes**.
- 6.8.50 **If** pressure rise on PIT-04 is **greater than 0.03 psi per 10 minutes**, **then** notify FLM for further instructions.
- 6.8.51 Document successful post-passivation leak rate on CP4-OP-0120-F01, *C-410-K Passivation of PCTC Component(s) Checklist*.
- 6.8.52 **If** the conditions of Step 6.8.34 were **NOT** met **and** NTC system pressure dropped **greater than 0.5 psi (NOT** attributable to a drop in temperature) during the 6 hour heating cycle, **then** re-perform Section **6.8 unless** directed otherwise by FLM.

## 6.9 Disconnecting PCTC Component(s)

### Facility Operations Personnel

- 6.9.1 Throttle open IMIV **and** adjust PCV-100 as necessary to maintain PCTC component system pressure **between 16 and 18 psia** as read on PIT-04 on ATB. Chg.  
B
- 6.9.2 Notify IH of intent to disconnect PCTC components from C-410-K manifold pigtail.
- 6.9.3 **If** NTC is connected **and** it is desired to disconnect NTC, **then** perform the following:
  - A. Close the following valves:
    - Text Deleted Chg.  
B
    - Text Deleted
    - GL-02
    - GL-01
  - B. Open the following valves:
    - GL-05
    - GL-06

NOTE:

IH personnel may determine at any time during component disconnection that Facility Operations personnel can doff respiratory protection and discontinue portable monitoring before all PCTC component(s) are disconnected and the C-410-K manifold pigtail reconnected to the manifold, based on atmospheric monitoring.

- 6.9.4** Don pressure demand respirator protection as directed by CP3-OP-0020, *Use of Atmosphere-Supplying Respirator*, **and** initiate portable HF monitoring as instructed by IH.

NOTE:

PCTC component(s) should be disconnected beginning with the component farthest from C-410-K manifold in terms of flow path. This practice allows for PCTC components to remain nitrogen buffered to the fullest extent possible before disconnection and plugging/capping.

- 6.9.5** If piping/tubing is connected to V-102 connection on ATB, **then** disconnect piping/tubing as follows:

CAUTION:

If exposed to oil or water, **then** damage to fluorine connections, gaskets, or fittings may occur.

- A. Don clean neoprene or nitrile gloves.
- B. Don clean, loose-fitting leather gloves while disconnecting connection.

NOTE:

Allowing PCTC component(s) to remain open to atmosphere for an extended period may result in degradation of the protective passivation layer.

- C. Disconnect piping/tubing **and** install plugs/caps on connections.
- D. Close V-102.

- 6.9.6** If piping/tubing is connected to V-101 connection on ATB, **then** disconnect piping/tubing as follows:

CAUTION:

If exposed to oil or water, **then** damage to fluorine connections, gaskets, or fittings may occur.

- A. Don clean neoprene or nitrile gloves.
- B. Don clean, loose-fitting leather gloves while disconnecting connection.

NOTE:

Allowing PCTC component(s) to remain open to atmosphere for an extended period may result in degradation of the protective passivation layer.

- C. Disconnect piping/tubing **and** install plugs/caps on connections.
- D. Close V-101.

**6.9.7** If piping/tubing is connected to V-104 connection on ATB, **then** disconnect piping/tubing as follows:

**CAUTION:**

if exposed to oil or water, **then** damage to fluorine connections, gaskets, or fittings may occur.

- A. Don clean neoprene or nitrile gloves.
- B. Don clean, loose-fitting leather gloves while disconnecting connection.

**NOTE:**

Allowing PCTC component(s) to remain open to atmosphere for an extended period may result in degradation of the protective passivation layer.

- C. Disconnect piping/tubing **and** install plugs/caps on connections.
- D. Close V-104.

**6.9.8** If NTC is **NOT** connected, **then** disconnect manifold pigtail from ATB as follows:

- A. Ensure the following valves are closed:
  - V-101
  - V-102
  - V-104
- B. Close V-103.

**CAUTION:**

If exposed to oil or water, **then** damage to fluorine connections, gaskets, or fittings may occur.

- C. Don clean neoprene or nitrile gloves.
- D. Don clean, loose-fitting leather gloves while disconnecting connection.

**NOTE:**

Allowing PCTC component(s) to remain open to atmosphere for an extended period may result in degradation of the protective passivation layer.

- E. Disconnect manifold pigtail from V-103 connection on ATB **and** install plug/cap on V-103 connection.
- F. Remove dust cap near V-105 on C-410-K manifold.
- G. Connect C-410-K manifold pigtail to V-105 on C-410-K manifold.
- H. Ensure IMIV is fully open.
- I. Check nitrogen purge flow at the C-410-K PBBV for positive pressure indication.

**6.9.9** If NTC is connected **and** it is desired to disconnect NTC, **then** disconnect NTC as follows:

**A.** Ensure the following valves are closed:

- V-101
- V-102
- V-104

**B.** Close V-103.

**CAUTION:**

**If** exposed to oil or water, **then** damage to fluorine connections, gaskets, or fittings may occur.

**C.** Don clean neoprene or nitrile gloves.

**D.** Don clean, loose-fitting leather gloves while disconnecting connection.

**NOTE:**

Allowing PCTC component(s) to remain open to atmosphere for an extended period may result in degradation of the protective passivation layer.

**E.** Disconnect pigtail between NTC and ATB **and** install plugs/caps on connections.

**F.** Close the following valves:

- GL-05
- GL-06

**G.** Disconnect manifold pigtail as follows:

1. Disconnect manifold pigtail from GL-01 connection on NTC **and** install plug/cap on GL-01 connection.
2. Remove pigtail VCR adaptor fitting **and** install the reverse threaded CGA adaptor for V-105 connection.
3. Remove dust cap near V-105 on C-410-K manifold.
4. Connect C-410-K manifold pigtail to V-105 on C-410-K manifold.
5. Ensure IMIV is fully open.
6. Check nitrogen purge flow at the C-410-K PBBV for positive pressure indication.

**H.** Position the following NTC disconnect switches to OFF:

- 480 VAC DISCONNECT SWITCH
- PLC CONTROL PANEL DISCONNECT SWITCH

**I.** Position 480 VOLTS supply disconnect or breaker to OPEN/OFF.

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- J.** Shut down diesel generator.
- K.** Disconnect Ethernet cable between ATB and NTC.
- L.** Disconnect NTC electrical cord from the 480VAC supply receptacle or extension cord.
- M.** Unlock casters **and** release wheel brakes.

**6.9.10** If **NOT** already completed as directed by IH, **then** perform the following:

- A.** Discontinue portable HF monitoring as directed by IH.
- B.** Doff respirator
- C.** Shut down air cart according to CP3-OP-0020, *Use of Atmosphere-Supplying Respirator*.

**6.9.11** Ensure the following valves are closed:

- V-311
- V-312
- V-313
- V-314

**6.9.12** Turn off ATB purge pump using pump power switch.

**6.9.13** Position the following disconnect switches to OFF:

- ATB 480V AC disconnect switch on POWER DISTRIBUTION PANEL
- 480 VOLTS supply receptacle.

**6.9.14** Unplug electrical cords from 480 VOLTS supply receptacle to ATB.

**6.9.15** Ensure the following valves are closed:

- Plant air supply connection isolation valve
- DRY AIR PURGE BLOCK #1
- DRY AIR PURGE BLOCK #2 (if installed)

**6.9.16** Disconnect airline from plant air supply connection to ATB.

**6.9.17** Remove wheel chocks on ATB.

## **7.0 ACCEPTANCE CRITERIA**

Acceptance criteria contained within the procedure instructions.

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## **8.0 POST PERFORMANCE WORK ACTIVITIES**

Close PV-104B

## **9.0 RECORDS**

### **9.1 Records Generated**

The following records may be generated by this procedure:

CP4-OP-0120-F01, *C-410-K Passivation of PCTC Component(s) Checklist*

### **9.2 Records Disposition**

The records are to be maintained in accordance with CP3-RD-0010, *Records Management Process*.

**Appendix A – Acronyms/Definitions**

**ACRONYMS**

**ATB** – Analytical Test Buggy

**CAAS** – Criticality Accident Alarm System

**CFR** – Code of Federal Regulations

**EM** – Electrical Maintenance

**F<sub>2</sub>** - Fluorine

**FPDP** – Fluor Paducah Deactivation Project

**FTIR** - Fourier Transform Infrared

**FLM** – Front Line Manager

**HMI** – Human Machine Interface

**IH** – Industrial Hygiene

**ICT** – In Situ Chemical Treatment

**IMIV** – In-line Manual Isolation Valve

**JHA** – Job Hazard Analysis

**MG** – Mixed Gas

**NTC** – Sodium Fluoride Trap Cart

**OJT** – On-The-Job Training Guide

**PBBV** – Pigtail Buffer Bleed Valve

**PCTC** – Portable Cell Treatment Cart

**POINT** – Paducah Operator Interface

**QC** – Quality Control

**SME** – Subject Matter Expert

**VCR** – Variable Compression Ratio

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## Appendix A – Acronyms/Definitions (Continued)

### **DEFINITIONS**

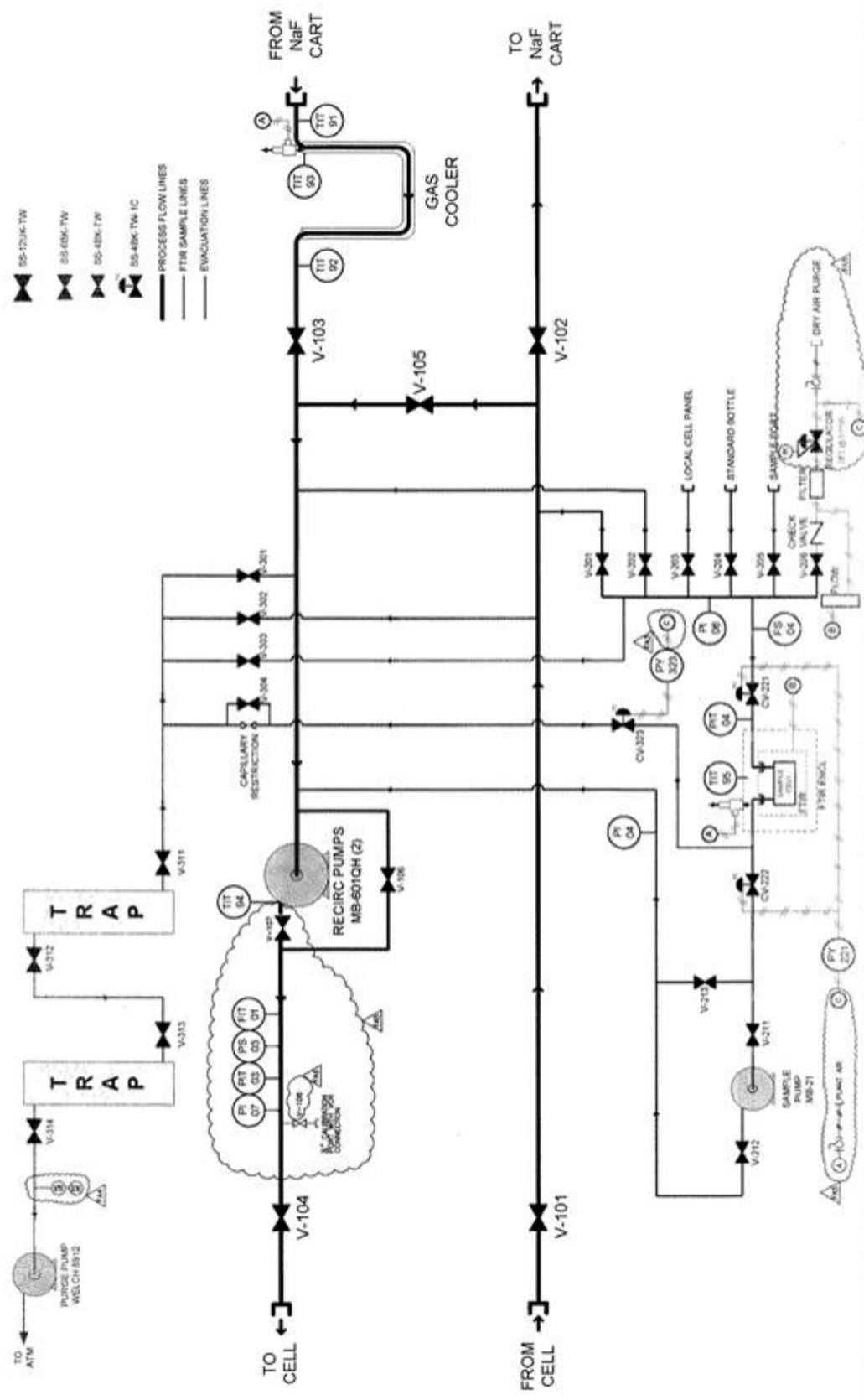
**Analytical Test Buggy (ATB)** - a component of the PCTC system, will analyze the process gases to determine the effectiveness of the deposit removal, trap loading, and concentrations of relevant treatment gases and reaction products. The ATB is equipped with an FTIR to monitor and record relevant constituents in the gas stream so that treatment effectiveness and a treatment end point can be determined. The ATB also includes a recirculation pump, which provides the motive force for gas flow through the cell, into the NaF cart traps, connecting tubing, and instrumentation. The ATB also includes two small chemical traps connected to a small vacuum pump to allow evacuation of the test buggy and the NaF cart for change-out of NaF carts in the middle of cell treatment.

**Fluorine (F<sub>2</sub>)** — highly toxic pale yellow gas with a sharp, pungent, irritating odor. An odor threshold of 0.035 ppm. F<sub>2</sub> is the most powerful oxidizing agent known. It reacts with virtually all inorganic and organic substances, including water. By Department of Transportation classification, F<sub>2</sub> is classified as a poison gas and an oxidizer. Route of entry to the human body includes inhalation and skin or eye contact. Fluorine is used in a 20% fluorine 80% nitrogen mix.

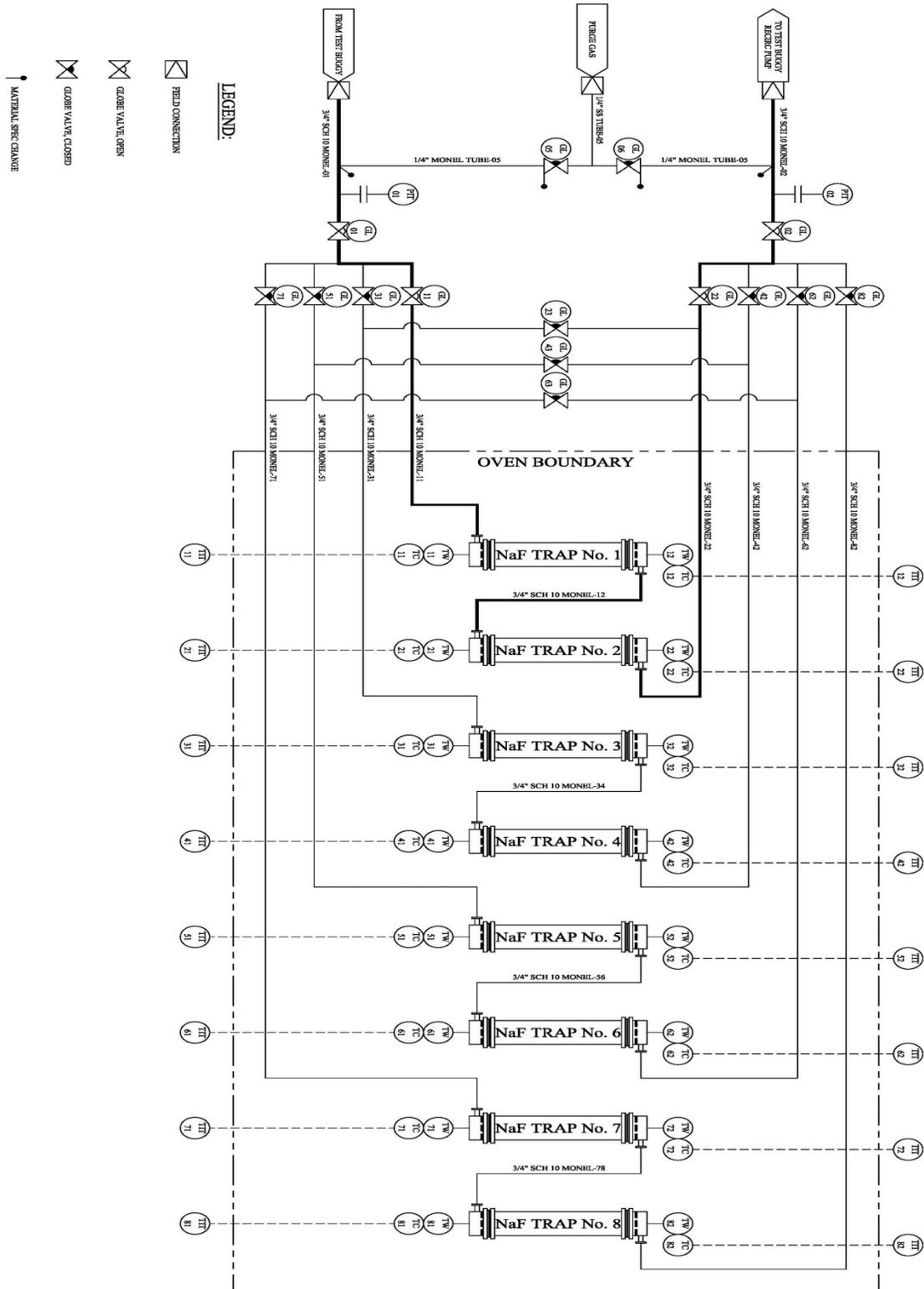
**NaF Trap Cart (NTC)** –a component of the PCTC system provides a means of real-time trapping of UF<sub>6</sub> from the treatment gases and reaction products using NaF as the sorbent media during the cell treatment. The NTC design includes two banks of four traps The banks are enclosed in an insulated oven to support on-board heating for trapping and regeneration.

**Portable Cell Treatment Cart (PCTC)** – Includes ATB, NTC, flexible metal hoses, rigid piping, pipe connections, and associated pigtails – system used at FPDP to perform In-Situ Chemical Treatment (ICT) activities.

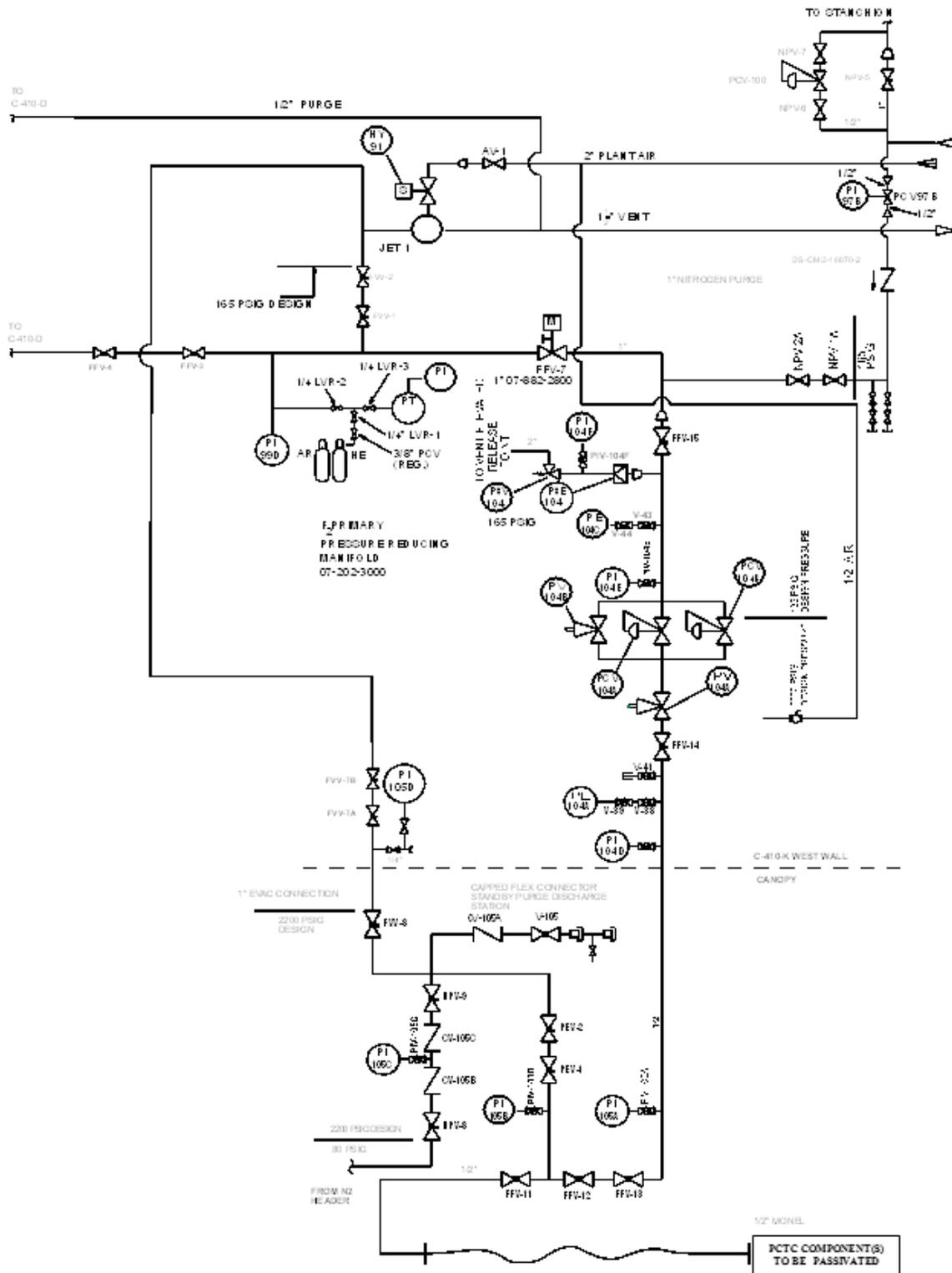
Appendix B – Analytical Test Buggy (ATB) Diagram



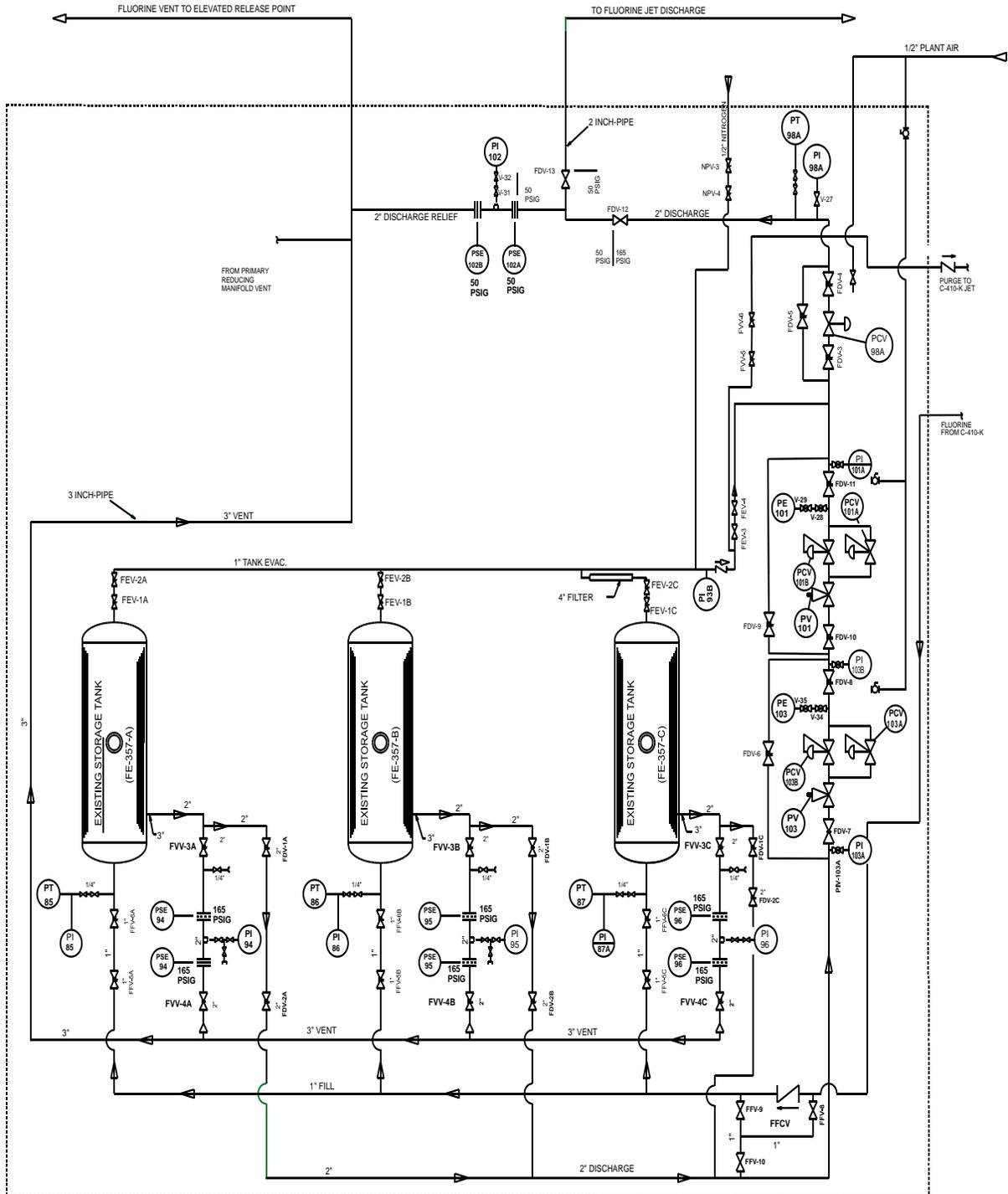
**Appendix C – NaF Trap Cart (NTC) Diagram**



Appendix D –C-410-K and Canopy Manifold with Pigtail



Appendix E – C-410-D Fluorine Storage Tanks and Piping



**Appendix F - C-410-D and C-410-K Initial Valve Lineup for PCTC Component Passivation**

<b>Valve</b>	<b>Position</b>		<b>Valve</b>	<b>Position</b>	
FDV-13	Locked Closed		FDV-2A	Closed	
FDV-12	Locked Closed		FVV-3A	Sealed Open	
NPV-3	Sealed Closed		FVV-4A	Sealed Open	
NPV-4	Sealed Closed		FFV-6A	Open	
FDV-3	Sealed Closed		FFV-5A	Closed	
FDV-4	Sealed Closed		FFV-8	Closed	
FDV-5	Closed		FFV-9	Closed	
FVV-6	Sealed Closed		FFV-10	Closed	
FVV-5	Sealed Closed		FFV-4	Open	
FEV-4	Sealed Closed		FFV-3	Open	
FEV-3	Sealed Closed		FFV-7	Open	
FEV-2C	Sealed Closed		FVV-1	Sealed Closed	
FEV-1C	Sealed Closed		FVV-2	Sealed Closed	
FEV-2B	Sealed Closed		AV-1	Closed	
FEV-1B	Sealed Closed		NSV-2	Open	
FEV-2A	Sealed Closed		NPV-5	Closed	
FEV-1A	Sealed Closed		NPV-6	Open	
FDV-11	Closed		NPV-7	Open	
FDV-10	Closed		LVR-1	Closed	
FDV-9	Closed		LVR-2	Closed	
FDV-8	Closed		LVR-3	Open	
FDV-6	Closed		NPV-2A	Sealed Closed	
FDV-7	Closed		NPV-1A	Sealed Closed	
FDV-1C	Closed		FFV-15	Open	
FDV-2C	Closed		FFV-14	Closed	
FVV-3C	Sealed Open		FFV-13	Closed	
FVV-4C	Sealed Open		FFV-12	Closed	
FFV-6C	Open		FFV-11	Open	
FFV-5C	Closed		V-105	Closed	
FDV-1B	Closed		PEV-1	Open	
FDV-2B	Closed		PEV-2	Open	
FVV-3B	Sealed Open		NPV-9	Open	
FVV-4B	Sealed Open		NPV-8	Open	
FFV-6B	Open		FVV-8	Open	
FFV-5B	Closed		FVV-7A	Closed	
FDV-1A	Closed		FVV-7B	Closed	

**Appendix G – PCTC Component Passivation Lineup**

<b>NTC Lineup</b>					
<b>Valve</b>	<b>Position</b>		<b>Valve</b>	<b>Position</b>	
GL-01	Open		GL-62	Open	
GL-02	Open		GL-82	Open	
GL-11	Open		GL-23	Open	
GL-31	Open		GL-43	Open	
GL-51	Open		GL-63	Open	
GL-71	Open		GL-05	Closed	
GL-22	Open		GL-06	Closed	
GL-42	Open				

<b>ATB Lineup</b>					
<b>Valve</b>	<b>Position</b>		<b>Valve</b>	<b>Position</b>	
V-101	Open		V-301	Open	
V-102	Open		V-302	Open	
V-103	Open		V-303	Open	
V-104	Open		V-107*	Open	
V-105	Open		V-108*	Closed	
V-106	Open		V-211	Open	
V-201	Open		V-212	Open	
V-202	Open		V-213	Open	
V-203	Open		V-304	Open	
V-204	Open		V-311	Closed	
V-205	Open		V-312	Open	
V-206	Closed		V-313	Open	
			V-314	Open	

\* - Not installed on ATB-01

**Appendix H – Table of Doubling Purges**

<b>Ratio of Purge Pressure To Evacuation Pressure</b>	<b>Number of Purge and Evacuation Cycles Necessary to Equal 20 Doubling Purges</b>
1.25	62
1.5	34
1.75	25
2	20
4	10
6	8
8	7
10	6
15	5

To determine Ratio, divide purge pressure by evacuation pressure and round down to closest ratio in table.

**Examples:**

**If** purge pressure is 4 psi and evacuation pressure is 1 psi,

$$4 \div 1 = 4$$

the ratio used would be 4.

**If** purge pressure is 15 psi and evacuation pressure is 1.6 psi,

$$15 \div 1.6 = 9.375$$

the ratio used would be 8.

**CP4-OP-0120-F01 – C-410-K Passivation of PCTC Components Checklist**

Requirement	Completed (√ or N/A)	Time	System Temp.	System Pressure	Operator Initials	Badge No.	Date
NTC has been verified to <b>NOT</b> have been previously aligned to a UF <sub>6</sub> system							
NTC NaF media has been verified to be installed							
ATB has been verified to <b>NOT</b> have been previously aligned to a UF <sub>6</sub> system							
Additional piping/tubing being connected to ATB has been verified to <b>NOT</b> have been previously aligned to a UF <sub>6</sub> system							
Pre-passivation Leak Rate acceptable							
Passivation with 10% F <sub>2</sub> at Ambient Temperature Start							
Passivation with 10% F <sub>2</sub> at Ambient Temperature End							
Passivation with 10% F <sub>2</sub> at Ambient Temperature Post Leak Rate acceptable							
Passivation with 20% F <sub>2</sub> at Ambient Temperature Start							
Passivation with 20% F <sub>2</sub> at Ambient Temperature End							
Passivation with 20% F <sub>2</sub> at Ambient Temperature Post Leak Rate acceptable							

**CP4-OP-0120-F01 – C-410-K Passivation of PCTC Components Checklist (Continued)**

Requirement	Completed (√ or N/A)	Time	System Temp.	System Pressure	Operator Initials	Badge No.	Date
Passivation of NTC with 20% F <sub>2</sub> at 250°F Start							
Passivation of NTC with 20% F <sub>2</sub> at 250°F End							
Passivation of NTC with 20% F <sub>2</sub> at 250°F Post Leak Rate acceptable							
Passivation of NTC with 20% F <sub>2</sub> at 650°F Start							
Passivation of NTC with 20% F <sub>2</sub> at 650°F End							
Passivation of NTC with 20% F <sub>2</sub> at 650°F Post Leak Rate acceptable							
Comments:							
FLM Review: _____ <div style="text-align: center;">Signature/Badge No./Date</div>							