CDF Gas Systems Procedures

1.0 Controlled Copies of this procedure.

Two controlled copies of this procedure will exist in the following locations:

1. CDF Gas Tech Bench in the north-east corner of the CDF Assembly Building
2. CDF Department Office

2.0 The Procedure.

To execute a procedure from the checklist, obtain the appropriate section from one of the tan folders on the CDF Gas Tech Bench. Make sure the date in the header of the checklist agrees with the date in the header of this page. Place the completed checklist in the primary mixing logbook, located on the table at the north end of the tech area.

3.0 Checklist

The following checklist is for the operation of the CDF Argon/Ethane Gas Mixing System. It assumes that all safety systems are in place, including the flammable gas and ODH detection systems, and that all pressure and leak tests have been performed successfully.

Table of Checklist Sections

Prior to performing an Argon/Ethane gas mix, the sections listed above must be followed, in order, from "Vent Stack Purge Flow Setting" through "Mixing Shed Valve Positioning for Automatic Mixing". Subsequently, gas mixing is allowed via the Moore Products programmable logic controller.

Vent Stack, Vacuum Vent, and Telephone Purge Flow Settings

Name:_____ Date:__/__/__ Time:____:____

The mix shed vent stack will be purged to keep the stack dry, to keep the oxygen content low, and to prevent flammable gas from lingering in the stack after a release.

__ Open FI-1701 until 50 SCFH of nitrogen is flowing into the vent stack.

The vent stack purge should be maintained continuously, not only during mixing.

Other purges to maintain continuously include the Vacuum Vent Line and the Telephone purge. Their flows must be set as indicated below:

__ Open FI-1703 until 60 SCFH of nitrogen is flowing into the vacuum vent line.

__ Open FI-1705 until 5 SCFH of nitrogen is flowing through the telephone purge box.

Vacuum Pump Oil Casing Purge Setting

Name: _____ Date:__/__/__ Time:____:____

The mix shed vacuum pump oil casing requires an inert gas purge if the pump is to be used for flammable gases. MV-1708 must be open for this procedure.
__ Open FI-1702 until 10 SCFH of nitrogen is flowing through the pump casing.

The oil casing purge should be maintained continuously, not just during mixing.

Mix Shed Vacuum System ROR Measurement

Name:_____ Date:__/__/__ Time:____:____

In later sections, it will be necessary to know the rate-of-rise (hereafter designated ROR) of the vacuum system.

__1. The valves surrounding the vacuum pump should initially be in the following positions:

(√)	Valve	Position
__	MV-1104	Closed
__	MV-1204	Closed
__	MV-1304	Closed
__	MV-1405	Closed
__	MV-1505	Closed
__	PV-1712 (EV-MSVACPISO)	Closed
__	MV-1713	Open
__	MV-1716	Closed
__	PV-1717 (EV-MSVACMAN)	Closed
__	MV-1718	Closed
__	MV-1711	Open
__	PV-1714 (EV-MSVACMBYP)	Open
__	MV-1715	Open

__ 2. Verify that PI-1700 and PT-MSVACM1 shows the vacuum manifold pressure to be 0 psig. Note that PT-MSVACM1 has a range 0 – 50 psia.
__ 3. Close PV-1714 (EV-MSVACMBYP).
__ 4. Start the vacuum pump.
__ 5. Open PV-1712 (EV-MSVACPISO) in order to pump down the vacuum header and verify its integrity.
__ 6. Wait until PT-MSVACM2 (PE-1700) reads 20 microns or less.

Note: PE-1700 is a Hastings DV-6R vacuum gauge. It has a range from 0-1000 microns. A micron is 1/1000th of a millimeter of mercury. PE-1701 is a Hastings DV-4R vacuum gage with a range of 0-20 millimeters of mercury. PI-1700 is a compound pressure gauge with a vacuum range of 0-30 inches of mercury. To summarize:

Instrument	Range in Microns absolute	Range in mm Hg absolute	Range in inches Hg gauge
PE-1700	0-1,000	0-1	
PE-1701	0-20,000	0-20	
PI-1700	760,000-0	760-0	0-30

When making vacuum measurements, use PI-1700 as a first rough measurement, followed by PE-1701 and finally PE-1700. Note that PI-1700 is a gauge instrument (higher numbers mean more vacuum) while PE-1700 and PE-1701 are absolute instruments (higher numbers mean less vacuum). As an example, a reading of 1000 microns on PE-1700 is equivalent to 1 mm Hg on PE-1701 is equivalent to 29.88 in Hg on PI-1700.

__ 7. Close PV-1712 (EV-MSVACPISO) and allow the header to equalize (wait about 60 seconds).

PT-MSVACM2 Reading 1: ____ microns.

__ 8. Perform a rate-of-rise measurement using PT-MSVACM2 as follows: After waiting another 60 seconds, take a second reading:

PT-MSVACM2 Reading 2: ____ microns.

Determine the vacuum header ROR by subtracting the first reading from the second and dividing by 1 minute.

Vacuum header ROR = (Reading 2 - Reading 1)/1 = ____ microns/min.

The ROR must be less than 1000 microns per hour or 17 microns per minute. If the ROR is greater than 17 microns per minute , a leak exists in the vacuum header which must be corrected before continuing. If the above number is greater than 17 microns/min., fix the leak and continue at step 5. If the header ROR is acceptable, shut off the vacuum pump. Write the vacuum header ROR on the bulletin board in the gas mixing shed and in the log book.

General Trailer Connection Notes

High pressure gas is dangerous to handle if not done properly. The gas exerts tremendous forces on its container and any lines open to it. These forces can be amplified if pressure changes occur rapidly, therefore valves should be cycled slowly and smoothly. All fittings should be rated for the maximum pressure expected, 1875 psig. Before connecting a trailer, inspect the hose for any damage or flaws. If in doubt, tag the hose out of service and notify the gas systems engineer or gas systems manager. Check the VCO O-rings and O-ring surfaces. Repair or replace if necessary. Never leave piping sections with ends open; always cap or plug when not in use. This will help keep the piping clean and protect the O-rings and O-ring surfaces.

Ethane Trailer No. 1 Hook Up

Name:_____ Date:__/__/__ Time:____:____

The steps to hook up a trailer include grounding the trailer, evacuating the trailer connection line and performing a ROR test, backfilling the line with ethane, and drawing a sample of ethane if necessary.

__ 1. To ground the trailer, simply connect the grounding cable to the trailer grounding lug. The lug should be clean of paint, dirt, or rust.
__ 2. Before connecting ethane trailer no. 1, the valves associated with ethane trailer no. 1 should be in the following positions:

(√)	Valve	Position
__	MV-1100	Closed (and capped)
__	MV-1101	Closed
__	PV-1100 (EV-MSTR1VLV)	Closed
__	MV-1102	Open
__	MV-1103	Closed
__	MV-1104	Closed
__	MV-1105	Closed (and capped or connected to sample bottle)
__	MV-1106	Open
__	MV-1107	Closed
__	MV-1108	Closed (and capped)

__ 3. Check that the vacuum valves for all the other trailers, MV-1505, MV-1405, MV-1204, and MV-1304 are locked closed. PV-1107 (EV-MSTR1SUP) must be closed as ethane trailer number 1 is not currently supplying the mixing system.

__ 4. The valves at the vacuum pump should initially be in the following positions:

(√)	Valve	Position
__	PV-1712 (EV-MSVACPISO)	Closed
__	MV-1713	Closed
__	MV-1716	Closed
__	PV-1717 (EV-MSVACMAN)	Closed
__	MV-1718	Closed
__	MV-1711	Open
__	PV-1714 (EV-MSVACMBYP)	Open
__	MV-1715	Open

__ 5. Open MV-1103 to blow down any connection line residual pressure to the vent stack. Verify atmospheric pressure in ethane trailer 1 supply circuit with PI-1100. If an ethane sample must be drawn, continue with step 6, else jump to step 10.
__ 6. Obtain the sample bottle for ethane trailer no. 1, and remove the cap from each end.
__ 7. Remove the caps from MV-1105 and the sample vent line. Install the sample bottle.
__ 8. Open the sample bottle top valve. Be sure the bottom valve is closed.
__ 9. Open MV-1105.

___

__ 10. Connect the trailer supply flex hose and available SV-1050 assembly to ethane trailer number 1, LEAVING THE TRAILER VALVE CLOSED.
__ 11. Open PV-1100 (EV-MSTR1VLV) via DMACS.
__ 12. Close MV-1103.
__ 13. Open MV-1104 followed by MV-1713.
__ 14. Verify that PI-1700 and PT-MSVACM1 show the vacuum manifold pressure to be less than 14.7 psia.
__ 15. Close PV-1714 (EV-MSVACMBYP).
__ 16. Start the vacuum pump.
__ 17. Open PV-1712 (EV-MSVACPISO) to pump down the vacuum header and connecting line.
__ 18. When the connecting line has been pumped to 20 microns or less as read by PT-MSVACM2 (PE-1700), close PV-1712 (EV-MSVACPISO) and wait 60 seconds for the line to equalize.

PT- MSVACM2 Reading 1: ____ microns.

__ 19. Conduct a ROR measurement on the combined vacuum header and connecting line system. Wait one minute and take a second reading using PT-MSVACM2. By subtracting the ROR value for the vacuum header, the ROR for the connecting line is determined. This value has been previously determined in the Vacuum System ROR Measurement on page 7 and for Run II is approximately 7 microns/min. The ROR for the connecting line should be less than 17 microns/min. If the rate of rise is greater, a leak exists which must be corrected before continuing.

PT-MSVACM2 Reading 2: ____ microns.

Combined ROR = (Reading 2 - Reading 1)/1 = ____ microns/min.

Connection Line ROR = Combined ROR – Vac. Header ROR (7 microns/min)
= ____ microns/min.

If the above number is greater than 17 microns/min., close PV-1712 (EV-MSVACPISO), fix the leak and return to step 17.
__ 20. Once the ROR is acceptable, isolate the vacuum header by closing MV-1104 and MV-1713.
__ 21. Be sure that the trailer tube manifold valves are open. Then, crack open the trailer supply valve on ethane trailer no. 1 briefly until the connecting line (and sample bottle if in use) are pressurized to 100 psig as read on PI-1100 (first black marking on the gauge).
__ 22. Close the ethane trailer no. 1 supply valve. If the pressure (PI-1100) has increased above 100 psig, bleed it back down to 100 psig through MV-1103.
__ 23. Using a hand held flammable gas detector, sniff all connections for flammable gas leaks.
__ 24. If any leaks are present, with the trailer valve closed, depressurize the connecting line by opening MV-1103. After making necessary repairs, return to step 12.
__ 25. If an ethane sample is not required, skip to step 28. To fill the sample cylinder, first open MV-1101 at least two turns, then perform steps a. thru d. below three times:

1st	2nd	3rd		
__	__	__	a.	Pressurize the sample cylinder with MV-1105 open.
__	__	__	b.	Close MV-1105.

___

__ __ __ c. Crack open the bottle bottom valve to vent the bottle to about 5 psig.
__ __ __ d. Close the bottle bottom valve when the bottle pressure is less than 5 psig.

__ 26. Close MV-1101, MV-1105, and the sample bottle top valve.
__ 27. Disconnect the sample bottle and replace the caps on the bottle, on MV-1105 and the sample vent line.
__ 28. Crack open ethane trailer no. 1 supply valve.
__ 29. Record the trailer pressure and temperature:

Trailer No. _____
Trailer Pressure: _____ [PSIG]
Trailer Temperature: _____ [°F]

__ 30. Turn off the vacuum pump.
__ 31. Close ethane trailer no. 1 supply valve.
__ 32. Close PV-1100 (EV-MSTR1VLV) via DMACS.
__ 33. Replace all valve locks.

___

Ethane Trailer No. 2 Hook Up

Name:_____ Date:__/__/__ Time:____:____

The steps to hook up a trailer include grounding the trailer, evacuating the trailer connection line and performing a ROR test, backfilling the line with ethane, and drawing a sample of ethane if necessary.

__ 1. To ground the trailer, simply connect the grounding cable to the trailer grounding lug. The lug should be clean of paint, dirt, or rust.
__ 2. Before connecting ethane trailer no. 2, the valves associated with ethane trailer no. 2 should be in the following positions:

(√)	Valve	Position
__	MV-1200	Closed (and capped)
__	MV-1201	Closed
__	PV-1200 (EV-MSTR2VLV)	Closed
__	MV-1202	Open
__	MV-1203	Closed
__	MV-1204	Closed
__	MV-1205	Closed (and capped or connected to sample bottle)
__	MV-1206	Open
__	MV-1207	Closed
__	MV-1208	Closed (and capped)

__ 3. Check that the vacuum valves for all the other trailers, MV-1505, MV-1405, MV-1104, and MV-1304 are locked closed. PV-1207 (EV-MSTR2SUP) must be closed as ethane trailer number 2 is not currently supplying the mixing system.

__ 4. The valves at the vacuum pump should initially be in the following positions:

(√)	Valve	Position
__	PV-1712 (EV-MSVACPISO)	Closed
__	MV-1713	Closed
__	MV-1716	Closed
__	PV-1717 (EV-MSVACMAN)	Closed
__	MV-1718	Closed
__	MV-1711	Open
__	PV-1714 (EV-MSVACMBYP)	Open
__	MV-1715	Open

__ 5. Open MV-1203 to blow down any connection line residual pressure to the vent stack. Verify atmospheric pressure in ethane trailer 2 supply circuit with PI-1200. If an ethane sample must be drawn, continue with step 6, else jump to step 10.
__ 6. Obtain the sample bottle for ethane trailer no. 2, and remove the cap from each end.
__ 7. Remove the caps from MV-1205 and the sample vent line. Install the sample bottle.
__ 8. Open the sample bottle top valve. Be sure the bottom valve is closed.
__ 9. Open MV-1205.

___

__ 10. Connect the trailer supply flex hose and available SV-1050 assembly to ethane trailer number 2, LEAVING THE TRAILER VALVE CLOSED.
__ 11. Open PV-1200 (EV-MSTR2VLV) via DMACS.
__ 12. Close MV-1203.
__ 13. Open MV-1204 followed by MV-1713.
__ 14. Verify that PI-1700 and PT-MSVACM1 show the vacuum manifold pressure to be less than 14.7 psia.
__ 15. Close PV-1714 (EV-MSVACMBYP).
__ 16. Start the vacuum pump.
__ 17. Open PV-1712 (EV-MSVACPISO) to pump down the vacuum header and connecting line.
__ 18. When the connecting line has been pumped to 20 microns or less as read by PT-MSVACM2 (PE-1700), close PV-1712 (EV-MSVACPISO) and wait 60 seconds for the line to equalize.

PT- MSVACM2 Reading 1: ____ microns.

__ 19. Conduct a ROR measurement on the combined vacuum header and connecting line system. Wait one minute and take a second reading using PT-MSVACM2. By subtracting the ROR value for the vacuum header, the ROR for the connecting line is determined. This value has been previously determined in the Vacuum System ROR Measurement on page 7 and for Run II is approximately 7 microns/min. The ROR for the connecting line should be less than 17 microns/min. If the rate of rise is greater, a leak exists which must be corrected before continuing.

PT-MSVACM2 Reading 2: ____ microns.

Combined ROR = (Reading 2 - Reading 1)/1 = ____ microns/min.

Connection Line ROR = Combined ROR – Vac. Header ROR (7 microns/min)
= ____ microns/min.

If the above number is greater than 17 microns/min., close PV-1712 (EV-MSVACPISO), fix the leak and return to step 17.
__ 20. Once the ROR is acceptable, isolate the vacuum header by closing MV-1204 and MV-1713.
__ 21. Be sure that the trailer tube manifold valves are open. Then, crack open the trailer supply valve on ethane trailer no. 2 briefly until the connecting line (and sample bottle if in use) are pressurized to 100 psig as read on PI-1200 (first black marking on the gauge).
__ 22. Close the ethane trailer no. 2 supply valve. If the pressure (PI-1200) has increased above 100 psig, bleed it back down to 100 psig through MV-1203.
__ 23. Using a hand held flammable gas detector, sniff all connections for flammable gas leaks.
__ 24. If any leaks are present, with the trailer valve closed, depressurize the connecting line by opening MV-1203. After making necessary repairs, return to step 12.
__ 25. If an ethane sample is not required, skip to step 28. To fill the sample cylinder, first open MV-1201 at least two turns, then perform steps a. thru d. below three times:

1st	2nd	3rd		
__	__	__	a.	Pressurize the sample cylinder with MV-1205 open.
__	__	__	b.	Close MV-1205.

___

__ __ __ c. Crack open the bottle bottom valve to vent the bottle to about 5 psig.
__ __ __ d. Close the bottle bottom valve when the bottle pressure is less than 5 psig.

__ 26. Close MV-1201, MV-1205, and the sample bottle top valve.
__ 27. Disconnect the sample bottle and replace the caps on the bottle, on MV-1205 and the sample vent line.
__ 28. Crack open ethane trailer no. 2 supply valve.
__ 29. Record the trailer pressure and temperature:

Trailer No. _____
Trailer Pressure: _____ [PSIG]
Trailer Temperature: _____ [°F]

__ 30. Turn off the vacuum pump.
__ 31. Close ethane trailer no. 2 supply valve.
__ 32. Close PV-1200 (EV-MSTR2VLV) via DMACS.
__ 33. Replace all valve locks.

___

Ethane Trailer No. 3 Hook Up

Name:_____ Date:__/__/__ Time:____:____

The steps to hook up a trailer include grounding the trailer, evacuating the trailer connection line and performing a ROR test, backfilling the line with ethane, and drawing a sample of ethane if necessary.

__ 1. To ground the trailer, simply connect the grounding cable to the trailer grounding lug. The lug should be clean of paint, dirt, or rust.
__ 2. Before connecting ethane trailer no. 3, the valves associated with ethane trailer no. 3 should be in the following positions:

(√)	Valve	Position
__	MV-1300	Closed (and capped)
__	MV-1301	Closed
__	PV-1300 (EV-MSTR3VLV)	Closed
__	MV-1302	Open
__	MV-1303	Closed
__	MV-1304	Closed
__	MV-1305	Closed (and capped or connected to sample bottle)
__	MV-1306	Open
__	MV-1307	Closed
__	MV-1308	Closed (and capped)

__ 3. Check that the vacuum valves for all the other trailers, MV-1505, MV-1405, MV-1104, and MV-1204 are locked closed. PV-1307 (EV-MSTR3SUP) must be closed as ethane trailer number 3 is not currently supplying the mixing system.

__ 4. The valves at the vacuum pump should initially be in the following positions:

(√)	Valve	Position
__	PV-1712 (EV-MSVACPISO)	Closed
__	MV-1713	Closed
__	MV-1716	Closed
__	PV-1717 (EV-MSVACMAN)	Closed
__	MV-1718	Closed
__	MV-1711	Open
__	PV-1714 (EV-MSVACMBYP)	Open
__	MV-1715	Open

__ 5. Open MV-1303 to blow down any connection line residual pressure to the vent stack. Verify atmospheric pressure in ethane trailer 3 supply circuit with PI-1300. If an ethane sample must be drawn, continue with step 6, else jump to step 10.
__ 6. Obtain the sample bottle for ethane trailer no. 3, and remove the cap from each end.
__ 7. Remove the caps from MV-1305 and the sample vent line. Install the sample bottle.
__ 8. Open the sample bottle top valve. Be sure the bottom valve is closed.
__ 9. Open MV-1305.

___

__ 10. Connect the trailer supply flex hose and available SV-1050 assembly to ethane trailer number 3, LEAVING THE TRAILER VALVE CLOSED.
__ 11. Open PV-1300 (EV-MSTR3VLV) via DMACS.
__ 12. Close MV-1303.
__ 13. Open MV-1304 followed by MV-1713.
__ 14. Verify that PI-1700 and PT-MSVACM1 show the vacuum manifold pressure to be less than 14.7 psia.
__ 15. Close PV-1714 (EV-MSVACMBYP).
__ 16. Start the vacuum pump.
__ 17. Open PV-1712 (EV-MSVACPISO) to pump down the vacuum header and connecting line.
__ 18. When the connecting line has been pumped to 20 microns or less as read by PT-MSVACM2 (PE-1700), close PV-1712 (EV-MSVACPISO) and wait 60 seconds for the line to equalize.

PT- MSVACM2 Reading 1: ____ microns.

__ 19. Conduct a ROR measurement on the combined vacuum header and connecting line system. Wait one minute and take a second reading using PT-MSVACM2. By subtracting the ROR value for the vacuum header, the ROR for the connecting line is determined. This value has been previously determined in the Vacuum System ROR Measurement on page 7 and for Run II is approximately 7 microns/min. The ROR for the connecting line should be less than 17 microns/min. If the rate of rise is greater, a leak exists which must be corrected before continuing.

PT-MSVACM2 Reading 2: ____ microns.

Combined ROR = (Reading 2 - Reading 1)/1 = ____ microns/min.

Connection Line ROR = Combined ROR - Vac. Header ROR (7 microns/min)
= ____ microns/min.

If the above number is greater than 17 microns/min., close PV-1712 (EV-MSVACPISO), fix the leak and return to step 17.
__ 20. Once the ROR is acceptable, isolate the vacuum header by closing MV-1304 and MV-1713.
__ 21. Be sure that the trailer tube manifold valves are open. Then, crack open the trailer supply valve on ethane trailer no. 3 briefly until the connecting line (and sample bottle if in use) are pressurized to 100 psig as read on PI-1300 (first black marking on the gauge).
__ 22. Close the ethane trailer no. 3 supply valve. If the pressure (PI-1300) has increased above 100 psig, bleed it back down to 100 psig through MV-1303.
__ 23. Using a hand held flammable gas detector, sniff all connections for flammable gas leaks.
__ 24. If any leaks are present, with the trailer valve closed, depressurize the connecting line by opening MV-1303. After making necessary repairs, return to step 12.
__ 25. If an ethane sample is not required, skip to step 28. To fill the sample cylinder, first open MV-1301 at least two turns, then perform steps a. thru d. below three times:

1st	2nd	3rd		
__	__	__	a.	Pressurize the sample cylinder with MV-1305 open.
__	__	__	b.	Close MV-1305.

___

__ __ __ c. Crack open the bottle bottom valve to vent the bottle to about 5 psig.
__ __ __ d. Close the bottle bottom valve when the bottle pressure is less than 5 psig.

__ 26. Close MV-1301, MV-1305, and the sample bottle top valve.
__ 27. Disconnect the sample bottle and replace the caps on the bottle, on MV-1305 and the sample vent line.
__ 28. Crack open ethane trailer no. 3 supply valve.
__ 29. Record the trailer pressure and temperature:

Trailer No. _____
Trailer Pressure: _____ [PSIG]
Trailer Temperature: _____ [°F]

__ 30. Turn off the vacuum pump.
__ 31. Close ethane trailer no. 3 supply valve.
__ 32. Close PV-1300 (EV-MSTR3VLV) via DMACS.
__ 33. Replace all valve locks.

Hydrogen Sulfide Vessel Regeneration

Name:_____ Date:__/__/__ Time:____:____

The hydrogen sulfide vessel will need to be regenerated before the first operation of the gas mixing system and periodically thereafter. Regeneration is accomplished by isolating the vessel, evacuating, purging with heated nitrogen, evacuating, and filling with ethane.

The H2S Vessel is regenerated automatically. This is possible when the Mixing Shed manual valves are correctly positioned according to *the Mixing Shed Valve Positioning for Automatic Mixing* found later in this document. The regeneration may be initiated from the DMACS software.

__ Set FI-1700 to flow 150 SCFH of nitrogen into the H2S Adsorber for the vessel regeneration procedure.

Argon Supply Line Evacuation and Fill

Name:_____ Date:__/__/__ Time:____:____

This procedure evacuates and fills the argon line from the Argon gas supply valves, MV-1913 and MV-1915, to PV-1901. It assumes that the Dewar and associated piping has been purged and filled, as well as the pneumatic argon supply line.

__ 1. Be sure the valves surrounding the Argon Dewar are in the following positions:

(√)	Valve	Position
__	MV-1913	Closed
__	MV-1915	Closed
__	MV-1914	Open
__	MV-1916	Open
__	MV-1920	Open
__	MV-1921	Open
__	PV-1901 (EV-MSARSUP)	Closed

__ 2. The valves surrounding the vacuum pump should initially be in the following positions:

(√)	Valve	Position
__	PV-1712 (EV-MSVACPISO)	Closed
__	MV-1713	Closed
__	MV-1716	Closed
__	PV-1717 (EV-MSVACMAN)	Closed
__	MV-1718	Closed
__	MV-1711	Open
__	PV-1714 (EV-MSVACMBYP)	Open
__	MV-1715	Open

__ 3. Open MV-1716.
__ 4. After verifying that PI-1700 and PT-MSVACM1 show the vacuum manifold pressure to be 0 psig, close PV-1714 (EV-MSVACMBYP) and start the vacuum pump.
__ 5. Open PV-1712 (EV-MSVACPISO).
__ 6. Wait until PT-MSVACM2 (PE-1700) reads 100 microns or below, and then close PV-1712 (EV-MSVACPISO). Wait 60 seconds for the system to stabilize, and then record the PT-MSVACM2 reading.

PT-MSVACM2 Reading 1: ____ microns.

__ 7. Conduct a ROR measurement on the combined vacuum header and connecting line system. Wait one minute and take a second reading using PT-MSVACM2. After subtracting the previously determined ROR value for the vacuum header, determine the ROR for the connecting line. The ROR should be less than 17 microns/min. If the rate of rise is greater, a leak exists which must be corrected before continuing.

PT-MSVACM2 Reading 2: ____ microns.

___

Combined ROR = (Reading 2 - Reading 1)/1 = ____ microns/min.

Connection Line ROR = Combined ROR - Vacuum Header ROR
= ____ microns/min.

If the above number is greater than 17 microns/min., fix the leak and return to step 5.

__ 8. Close MV-1716 and shut off the vacuum pump.

Ethane Supply Line Evacuation and Fill

Name:_____ Date:__/__/__ Time:____:____

This procedure evacuates and fills the ethane supply line from PV-1107, PV-1207, and PV-1307 through the vaporizer, oil filtering system, and hydrogen sulfide absorber, to PV-1708.

__ 1. Check that the valves associated with the ethane supply line are in the following positions:

(√)	Valve	Position
__	PV-1107 (EV-MSTR1SUP)	Closed
__	PV-1207 (EV-MSTR2SUP)	Closed
__	PV-1307 (EV-MSTR3SUP)	Closed
__	MV-1750	Open
__	MV-1751	Open
__	MV-1752	Open
__	MV-1753	Closed
__	MV-1754	Open
__	MV-1755	Closed
__	MV-1756	Closed
__	MV-1757	Open
__	MV-1758	Open
__	MV-1759	Closed
__	MV-1760	Open
__	MV-1761	Open
__	MV-1762	Closed
__	MV-1700	Maintain preset open position
__	PV-1700 (EV-MSADSFILL)	Open
__	PV-1701 (EV-MSADSFIL2)	Open
__	MV-1702	Maintain preset open position
__	PV-1702 (EV-MSADSVENT)	Closed
__	PV-1703 (EV-MSADSVNT2)	Closed
__	PV-1717 (EV-MSVACMAN)	Closed
__	MV-1707	Open
__	MV-1721	Open
__	MV-1706	Closed
__	MV-1705	Open
__	MV-1722	Open
__	PV-1708 (EV-MSADSOUT)	Closed
__	MV-1800	Open
__	PV-1800 (EV-MSETHSUP)	Open
__	PV-1801 (EV-MSETHVV)	Closed
__	MV-1802	Open
__	PCV-MSETHVLV	Open, may keep 100 psig set point

__ 2. Check that the valves surrounding the vacuum pump are in the following positions:

(√)	Valve	Position
__	PV-1712 (EV-MSVACPISO)	Closed
__	MV-1713	Closed

___

__	MV-1716	Closed
__	PV-1717 (EV-MSVACMAN)	Closed
__	MV-1718	Closed
__	MV-1711	Open
__	PV-1714 (EV-MSVACMBYP)	Open
__	MV-1715	Open

__ 3. Open PV-1717 (EV-MSVACMAN).
__ 4. After verifying that PI-1700 and PT-MSVACM1 show the vacuum manifold pressure to be 0 psig, close PV-1714 (EV-MSVACMBYP).
__ 5. Start the vacuum pump.
__ 6. Open PV-1712 (EV-MSVACPISO) slowly.
__ 7. Wait until PT-MSVACM2 (PE-1700) reads 100 microns or below, and then close PV-1712 (EV-MSVACPISO). Wait 60 seconds for the system to stabilize, and then take a reading.

PT-MSVACM2 Reading 1: ____ microns.

__ 8. Conduct a ROR measurement on the combined vacuum header and connecting line system. Wait one minute and take a second reading using PT-MSVACM2. After subtracting the previously determined ROR value for the vacuum header, determine the ROR for the connecting line.

PT-MSVACM2 Reading 2: ____ microns.

Combined ROR = (Reading 2 - Reading 1)/1 = ____ microns/min.

Connection Line ROR = Combined ROR - Vacuum Header ROR
= ____ microns/min.

If the above number is greater than 17 microns/min., fix the leak and continue at step 6. If the number is 17 micron/min. or less, continue below.
__ 9. Once the ROR is acceptable, isolate the vacuum header by closing PV-1717 (EV-MSVACMAN).
__ 10. Shut off the vacuum pump.
__ 11. Close MV-1752, MV-1707, and PV-1701 (EV-MSADSFIL2).
__ 12. Be sure the PCV-MSETHVLV set point is 100 psig. If ethane trailer 1 is currently supplying ethane for the mixing system, close PV-1100 (EV-MSTR1VLV) and then open PV-1107 (EV-MSTR1SUP) to reintroduce ethane into the ethane supply line. If trailer 2 is the supply trailer, close PV-1200 (EV-MSTR2VLV) and open PV-1207 (EV-MSTR2SUP); and if trailer 3 is the supply trailer, close PV-1300 (EV-MSTR3VLV) and open PV-1307 (EV-MSTR3SUP). After the line pressure is stable as read on PT-MSADS and PI-1701, reopen the currently approved supply trailer valve PV-1100 (EV-MSTR1VLV), or PV-1200 (EV-MSTR2VLV), or PV-1300 (EV-MSTR3VLV).
__ 13. Once PT-MSADS and PI-1701 indicate 100 psig, open PV-1701 (EV-MSADSFIL2) and close PV-1700 (EV-MSADSFILL). Open MV-1706.

The system is now evacuated and charged with ethane up to PV-1708. Before mixing, all Mix Shed valve positions will be confirmed using *Mixing Shed Valve Positioning for Automatic Mixing* found later in this procedure.

Flow Control Rack and Compressor Suction Evacuation and Fill

Name:_____ Date:__/__/__ Time:____:____

This procedure evacuates and fills the ethane line from PV-1708 through the ethane flow control station, the argon line from PV-1901 through the argon flow control station, and the mix line from the flow control stations to the compressors behind CDF.

__ 1. Configure the valves in and around the mix shed and flow control stations in the following positions:

(√)	Valve	Position
__	MV-1406	Closed
__	MV-1506	Closed
__	PV-1708 (EV-MSADSOUT)	Closed
__	PV-1709 (EV-MSAEDEL)	Open
__	PV-1710 (EV-MSAEMIXVT)	Closed
__	PV-1719 (EV-MSAE2GM)	Open
__	PV-1721 (EV-MSGMZERO)	Closed
__	PV-1722 (EV-MSGMBYP)	Closed
__	MV-1724	Closed
__	PV-1725 (EV-MSAFCOUT1)	Open
__	PV-1727 (EV-MSAFCOUT2)	Open
__	PV-1728 (EV-MSAFCIN1)	Open
__	PV-1730 (EV-MSAFCIN2)	Open
__	MV-1730	Closed
__	MV-1731	Closed
__	MV-1732	Closed
__	PV-1733 (EV-MSEFCOUT1)	Open
__	MV-1734	Closed
__	PV-1736 (EV-MSEFCOUT2)	Open
__	PV-1737 (EV-MSEFCIN1)	Open
__	PV-1739 (EV-MSEFCIN2)	Open
__	MV-1740	Open
__	MV-1741	Open
__	PV-1901 (EV-MSARSUP)	Closed
__	MV-1930	Closed

__ 2. Configure the valves surrounding the vacuum pump in the following positions:

(√)	Valve	Position
__	PV-1712 (EV-MSVACPISO)	Closed
__	MV-1713	Closed
__	MV-1716	Closed
__	PV-1717 (EV-MSVACMAN)	Closed
__	MV-1718	Closed
__	MV-1711	Open
__	PV-1714 (EV-MSVACMBYP)	Open
__	MV-1715	Open

___

__ 3. Open the four flow controllers (FCV-MSAFC1, FCV-MSAFC2, FCV-MSEFC1, and FCV-MSEFC2) by putting all four command control switches (on the Hastings Flow Power Supply in the Mix Shed Rack) in the "open" position.
__ 4. Open MV-1718 followed by MV-1724, MV-1731, MV-1732, and MV-1734.
__ 5. After verifying that PT-MSVACM1 and PI-1700 show the vacuum manifold pressure to be 0 psig, close PV-1714 (EV-MSVACMBYP).
__ 6. Start the vacuum pump.
__ 7. Open PV-1712 (EV-MSVACPISO).
__ 8. Proceed to the gas storage shed and ensure that the following valves associated with the compressors are in the following positions:

(√)	Valve	Position
__	MV-2002	Closed
__	MV-2003	Open
__	MV-2004	Closed
__	PV-2005 (EV-GSCMPIN)	Closed
__	MV-2016	Closed
__	MV-2104	Closed
__	MV-2204	Closed
__	MV-2208	Closed
__	MV-2304	Closed
__	MV-2503	Closed
__	MV-2603	Closed
__	MV-2506	Closed
__	MV-2606	Closed

__ 9. Connect the portable vacuum pump to MV-2002 via a flex hose.
__ 10. Connect a Hastings thermocouple vacuum gauge to the portable vacuum pump.
__ 11. Start the portable vacuum pump.
__ 12. Open MV-2002 and then open MV-2004 to begin pumping down the compressor suction line.
__ 13. Wait until the vacuum gauge reads 100 microns or less, then close MV-2002 and return to the gas mixing shed.
__ 14. Wait until PT-MSVACM2 reads 100 microns or below.
__ 15. Close PV-1712 (EV-MSVACPISO) and wait 60 seconds for the system to equalize.

PT-MSVACM2 Reading 1: ____ microns.

__ 16. Conduct a ROR measurement on the combined vacuum header and flow control stations. Wait five minutes and take a reading using PT-MSVACM2.

PT-MSVACM2 Reading 2: ____ microns.

Combined ROR = (Reading 2 - Reading 1)/5 = ____ microns/min.

After subtracting the previously determined ROR value for the vacuum header, determine the ROR for the flow control stations.

Flow Control Rack ROR = Combined ROR - Vacuum Header ROR
= ____ microns/min.

___

If the above number is greater than 17 microns/min., fix the leak; then repeat step 7 and continue at step 14. If the number is 17 micron/min. or less, continue below.

__ 17. Once the ROR is acceptable, isolate the vacuum header by closing MV-1718.
__ 18. Shut off the Mix Shed vacuum pump.

Return to the gas storage shed.
Perform a rate-of-rise measurement on the compressor suction line:

__ 19. Open MV-2002.
__ 20. Wait until the vacuum pump gauge reads 100 microns or below, and then close MV-2002. Wait 60 seconds for the system to stabilize, and then take a reading from the Gas Storage Shed vacuum header vacuum gauge attached at MV-2208:

Vacuum header gauge Reading 1: ____ microns.

__ 21. Wait five minutes and take a second reading using the vacuum header gauge.

Vacuum header gauge Reading 2: ____ microns.

Compressor Suction Line ROR
= (Reading 2 - Reading 1)/5 = ____ microns/min.

If the above number is greater than 17 microns/min., fix the leak and return to step 19. If the number is 17 micron/min. or less, continue below.

__ 22. Turn off the portable vacuum pump.
__ 23. Close MV-2004, and return to the gas mixing shed.
__ 24. Close MV-1724, MV-1731, MV-1732, and MV-1734.
__ 25. Close PV-1709 (EV-MSAEDEL), PV-1725 (EV-MSAFCOUT1), PV-1727 (EV-MSAFCOUT2), PV-1733 (EV-MSEFCOUT1), and PV-1736 (EV-MSEFCOUT2).
__ 26. Open PV-1901 (EV-MSARSUP) to let 100 psig argon fill the argon flow control station.
__ 27. Open PV-1708 (EV-MSADSOUT) to allow ethane to fill the ethane flow control station.
__ 28. Open PV-1725 (EV-MSAFCOUT1) momentarily to fill the mix line with argon up to PV-1709 and then close it again.
__ 29. CLOSE each of the following valves:

(√)	Valve
__	PV-1708 (EV-MSADSOUT)
__	PV-1719 (EV-MSAE2GM)
__	PV-1728 (EV-MSAFCIN1)
__	PV-1730 (EV-MSAFCIN2)
__	PV-1737 (EV-MSEFCIN1)
__	PV-1739 (EV-MSEFCIN2)
__	PV-1901 (EV-MSARSUP)

__ 30. Return all four command control switches to the "auto" position.

Note that the section of piping from PV-1709 to the compressor suction will be filled with Argon/Ethane mixture during the first mix.

Gas Storage Shed Vacuum Manifold ROR

Name:_____ Date:__/__/__ Time:____:____

This procedure determines the rate-of-rise of the Gas Storage Shed vacuum manifold.

__ 1. Configure the Storage Shed valves in the following positions:

(√)	Valve	Position
__	MV-2002	Closed
__	MV-2003	Open
__	MV-2004	Closed
__	MV-2016	Closed
__	MV-2104	Closed
__	MV-2204	Closed
__	MV-2208	Open
__	MV-2304	Closed
__	MV-2503	Closed
__	MV-2506	Closed
__	MV-2603	Closed
__	MV-2606	Closed

__ 2. Connect the portable vacuum pump to MV-2002 via a flex hose.
__ 3. Start the portable vacuum pump.
__ 4. Open MV-2002 to begin pumping down the vacuum header.
__ 5. Wait until the Gas Storage Shed vacuum header vacuum gauge on MV-2208 reads 100 microns or less, then close MV-2002.
__ 6. Wait 60 seconds for the system to equalize then take a reading:

Vacuum header gauge Reading 1: ____ microns.

__ 7. Wait five minutes and take a second reading of the vacuum header gauge:

Vacuum header gauge Reading 2: ____ microns.

ROR = (Reading 2 - Reading 1)/5 = ____ microns/min.

If the above number is greater than 17 microns/min., fix the leak and continue the test at step 4. If the number is 17 micron/min. or less, continue below.

__ 8. Once the ROR is acceptable, shut off the portable vacuum pump.

Gas Shed Piping Evacuation

Name:_____ Date:__/__/__ Time:____:____

This procedure evacuates the Storage Shed Compressor Circuit, including the Mix Shed to Compressor Suction line; from PV-1709 in the Mixing Shed up to the gas storage tanks.

__ 1. Close MV-1406, MV-1506, and PV-1709 (EV-MSAEDEL) at the Gas Mixing Shed.
__ 2. Configure the valves in the Gas Storage Shed in the following positions:

(√)	Valve	Position
__	MV-2001	Closed
__	PRV-2002	Fully Open
__	MV-2002	Closed
__	MV-2003	Open
__	MV-2004	Closed
__	PV-2005 (EV-GSCMPIN)	Open
__	MV-2006	Open
__	MV-2007	Open
__	MV-2008	Open
__	PV-2009 (EV-GSCMPBYP)	Open
__	MV-2010	Open
__	MV-2011	Open
__	PV-2013 (EV-GSCMPPURG)	Closed
__	MV-2016	Closed
__	PV-2016 (EV-GSETHCORR)	Closed
__	PRV-2020	Fully Open
__	PV-2026 (EV-GSARCORR)	Closed
__	PV-2101 (EV-GST1DRN)	Closed
__	PV-2102 (EV-GST1IN)	Closed
__	MV-2104	Closed
__	PV-2201 (EV-GST2DRN)	Closed
__	PV-2202 (EV-GST2IN)	Closed
__	MV-2204	Closed
__	MV-2208	Open
__	PV-2301 (EV-GST3DRN)	Closed
__	PV-2302 (EV-GST3IN)	Closed
__	MV-2304	Closed
__	MV-2503	Closed
__	PV-2504 (EV-GSC1OUT)	Closed
__	MV-2505	Closed
__	MV-2506	Closed
__	MV-2507	Closed
__	MV-2603	Closed
__	PV-2604 (EV-GSC2OUT)	Closed
__	MV-2605	Closed
__	MV-2606	Closed
__	MV-2607	Closed

___

__ 3. Connect the portable vacuum pump to MV-2002 via a flex hose.
__ 4. Start the vacuum pump.
__ 5. Open MV-2002 and then MV-2004 to begin pumping down the compressor circuit.
__ 6. Wait for the Gas Storage Shed vacuum header vacuum gauge on MV-2208 to read 100 microns or less, then close MV-2002.

Perform a ROR measurement on the combined vacuum header and compressor circuit:
__ 7. Wait 60 seconds for the system to equalize, then take a reading:

Vacuum header gauge Reading 1: ____ microns.

__ 8. Wait five minutes and take a second reading:

Vacuum header gauge Reading 2: ____ microns.

Combined ROR = (Reading 2 - Reading 1)/5 = ____ microns/min.

Subtract the previously determined ROR value for the Storage Shed vacuum header to determine the ROR for the compressor circuit.

Compressor Circuit ROR = Combined ROR - Vacuum Header ROR
= ____ microns/min.

If the above ROR is greater than 17 microns/min., fix the leak and continue the test at step 4. If the ROR is 17 micron/min. or less, continue below.

__ 9. Once the ROR is acceptable close MV-2004.
__ 10. Shut off the portable vacuum pump.

Storage Tank #1 Evacuation

Name:_____ Date:__/__/__ Time:____:____

This procedure evacuates the #1 Gas Shed storage tank.

__ 1. Configure the Gas Storage Shed valves in the following positions:

(√)	Valve	Position
__	MV-2002	Closed
__	MV-2003	Open
__	MV-2004	Closed
__	MV-2016	Closed
__	PV-2100 (EV-GST2OUT)	Closed
__	PV-2101 (EV-GST2DRN)	Closed
__	MV-2102	Open
__	PV-2102 (EV-GST2IN)	Closed
__	MV-2103	Closed
__	MV-2104	Closed
__	MV-2105	Closed
__	MV-2106	Open
__	MV-2107	Closed
__	MV-2204	Closed
__	MV-2208	Closed
__	MV-2304	Closed
__	MV-2503	Closed
__	MV-2506	Closed
__	MV-2603	Closed
__	MV-2606	Closed

__ 2. Connect the portable vacuum pump to MV-2002 via a flex hose.
__ 3. Start the vacuum pump.
__ 4. Open MV-2002 and then MV-2104 to begin pumping down storage tank #1.
__ 5. Wait for PE-2100 to read 100 microns or less, then close MV-2002.

Perform a ROR measurement on the combined vacuum header and storage tank #1:

__ 6. Wait 60 seconds after closing MV-2002 for the system to equalize, then take a reading:

PE-2100 Reading 1: ____ microns.

___

__ 7. Wait five minutes and take a second reading:

PE-2100 Reading 2: ____ microns.

Combined ROR = (Reading 2 - Reading 1)/5 = ____ microns/min.

Subtract the previously determined ROR value for the Storage Shed vacuum header to determine the ROR for storage tank #1.

Storage tank #1 ROR = Combined ROR - Vacuum Header ROR
= ____ microns/min.

If the above ROR is greater than 17 microns/min., fix the leak and continue the test at step 4. If the ROR is 17 microns/min. or less, continue below.

__ 8. Once the ROR is acceptable, close MV-2104.
__ 9. Shut off the portable vacuum pump.

Note: The sample line from tank #1 to the gas monitoring station will be purged separately with argon.

Storage Tank #2 Evacuation

Name:_____ Date:__/__/__ Time:____:____

This procedure evacuates the #2 Gas Shed storage tank.

__ 1. Configure the Gas Storage Shed valves in the following positions:

(√)	Valve	Position
__	MV-2002	Closed
__	MV-2003	Open
__	MV-2004	Closed
__	MV-2016	Closed
__	MV-2104	Closed
__	PV-2200 (EV-GST2OUT)	Closed
__	PV-2201 (EV-GST2DRN)	Closed
__	MV-2202	Open
__	PV-2202 (EV-GST2IN)	Closed
__	MV-2203	Closed
__	MV-2204	Closed
__	MV-2205	Closed
__	MV-2206	Open
__	MV-2207	Closed
__	MV-2208	Closed
__	MV-2304	Closed
__	MV-2503	Closed
__	MV-2506	Closed
__	MV-2603	Closed
__	MV-2606	Closed

__ 2. Connect the portable vacuum pump to MV-2002 via a flex hose.
__ 3. Start the portable vacuum pump.
__ 4. Open MV-2002 and then MV-2204 to begin pumping down storage tank #2.
__ 5. Wait for PE-2200 to read 100 microns or less, then close MV-2002.

Perform a ROR measurement on the combined vacuum header and storage tank #1.

__ 6. Wait 60 seconds after closing MV-2002 for the system to equalize, then take a reading:

PE-2200 Reading 1: ____ microns.

___

__ 7. Wait five minutes and take a second reading:

PE-2200 Reading 2: ____ microns.

Combined ROR = (Reading 2 - Reading 1)/5 = ____ microns/min.

Subtract the previously determined ROR value for the Storage Shed vacuum header to determine the ROR for storage tank #2.

Storage tank #2 ROR = Combined ROR - Vacuum Header ROR
= ____ microns/min.

If the above ROR is greater than 17 microns/min., fix the leak and continue the test at step 4. If the ROR is 17 micron/min. or less, continue below.

__ 8. Once the ROR is acceptable, close MV-2204.
__ 9. Shut off the portable vacuum pump.

Note: The sample line from tank #2 to the gas monitoring station will be purged separately with argon.

Storage Tank #3 Evacuation

Name:_____ Date:__/__/__ Time:____:____

This procedure evacuates the #3 Gas Shed storage tank.

__ 1. Configure the Gas Storage Shed valves in the following positions:

(√)	Valve	Position
__	MV-2002	Closed
__	MV-2003	Open
__	MV-2004	Closed
__	MV-2016	Closed
__	MV-2104	Closed
__	MV-2204	Closed
__	MV-2208	Closed
__	PV-2300 (EV-GST3OUT)	Closed
__	PV-2301 (EV-GST3DRN)	Closed
__	MV-2302	Open
__	PV-2302 (EV-GST3IN)	Closed
__	MV-2303	Closed
__	MV-2304	Closed
__	MV-2305	Closed
__	MV-2306	Open
__	MV-2503	Closed
__	MV-2506	Closed
__	MV-2603	Closed
__	MV-2606	Closed

__ 2. Connect the portable vacuum pump to MV-2002 via a flex hose.
__ 3. Start the portable vacuum pump.
__ 4. Open MV-2002 and then MV-2304 to begin pumping down storage tank #3.
__ 5. Wait for PE-2300 to read 100 microns or less then close MV-2002.

Perform a ROR measurement on the combined vacuum header and storage tank #3:

__ 6. Wait 60 seconds after closing MV-2002 for the system to equalize, then take a reading:

PE-2300 Reading 1: ____ microns.

___

__ 7. Wait five minutes and take a second reading:

PE-2300 Reading 2: ____ microns.

Combined ROR = (Reading 2 - Reading 1)/5 = ____ microns/min.

Subtract the previously determined ROR value for the Storage Shed vacuum header to determine the ROR for storage tank #3.

Storage tank #3 ROR = Combined ROR - Vacuum Header ROR
= ____ microns/min.

If the above ROR is greater than 17 microns/min., fix the leak and continue the test at step 4. If the ROR is 17 micron/min. or less, continue below.

__ 8. Once the ROR is acceptable, close MV-2304.
__ 9. Shut off the portable vacuum pump.

Note: The sample line from tank #3 to the gas monitoring station will be purged separately with argon.

Storage Tank #4 Evacuation

Name:_____ Date:__/__/__ Time:____:____

This procedure evacuates the #4 Gas Shed storage tank.

__ 1. Configure the Gas Storage Shed valves in the following positions:

(√)	Valve	Position
__	MV-2002	Closed
__	MV-2003	Open
__	MV-2004	Closed
__	MV-2016	Closed
__	PV-2100 (EV-GST1OUT)	Closed
__	MV-2104	Closed
__	PV-2200 (EV-GST2OUT)	Closed
__	MV-2204	Closed
__	MV-2208	Closed
__	PV-2300 (EV-GST3OUT)	Closed
__	MV-2304	Closed
__	MV-2400	Open
__	PRV-2400	Fully Open
__	PV-2400 (EV-GST4OUT)	Open
__	MV-2401	Open
__	PRV-2401	Fully Open
__	PV-2401 (EV-GSTRSUP)	Closed
__	MV-2402	Closed
__	MV-2403	Open
__	MV-2404	Open
__	MV-2405	Closed
__	MV-2410	Open
__	MV-2411	Closed
__	MV-2503	Closed
__	MV-2506	Closed
__	MV-2603	Closed
__	MV-2606	Closed
__	MV-8009	Closed
__	MV-8011	Closed

__ 2. Connect the portable vacuum pump to MV-2002 via a flex hose.
__ 3. Start the portable vacuum pump.
__ 4. Open MV-2002 and then MV-2016 to begin pumping down storage tank #4.
__ 5. Wait for PE-2400 to read 100 microns or less, then close MV-2002.

___

Perform a ROR measurement on the combined vacuum header and storage tank #4.

__ 6. Wait 60 seconds after closing MV-2002 for the system to equalize, then take a reading:

PE-2400 Reading 1: ____ microns.

__ 7. Wait five minutes and take a second reading:

PE-2400 Reading 2: ____ microns.

Combined ROR = (Reading 2 - Reading 1)/5 = ____ microns/min.

Subtract the previously determined ROR value for the Storage Shed vacuum header to determine the ROR for storage tank #4.

Storage tank #4 ROR = Combined ROR - Vacuum Header ROR
= ____ microns/min.

If the above ROR is greater than 17 microns/min., fix the leak and continue the test at step 4. If the ROR is 17 micron/min. or less, continue below.

__ 8. Once the ROR is acceptable, close MV-2016.
__ 9. Shut off the portable vacuum pump.

Note: The sample lines from tank #4 to the gas monitoring station on the main floor and in the Mix Shed will be purged separately with argon.

Gas Storage Shed System Backfill

Name:_____ Date:__/__/__ Time:____:____

This procedure backfills the previously evacuated lines in the Gas Storage Shed with argon gas.

__ 1. Close MV-1406, MV-1506, and PV-1709 (EV-MSAEDEL) at the Gas Mixing Shed.
__ 2. Configure the valves in the Gas Storage Shed in the following positions:

(√)	Valve	Position
__	MV-2001	Closed
__	PRV-2002	Fully Open
__	MV-2004	Closed
__	PV-2005 (EV-GSCMPIN)	Open
__	MV-2006	Open
__	MV-2007	Open
__	MV-2008	Open
__	PV-2009 (EV-GSCMPBYP)	Open
__	MV-2010	Open
__	MV-2011	Open
__	MV-2013	Open
__	PV-2013 (EV-GSCMPPURG)	Closed
__	MV-2016	Closed
__	PV-2016 (EV-GSETHCORR)	Closed
__	PRV-2020	Fully Open
__	PV-2026 (EV-GSARCORR)	Closed
__	PV-2100 (EV-GST1OUT)	Open
__	PV-2101 (EV-GST1DRN)	Open
__	MV-2102	Open
__	PV-2102 (EV-GST1IN)	Open
__	MV-2103	Closed
__	MV-2104	Closed
__	MV-2105	Closed
__	MV-2106	Open
__	MV-2107	Closed
__	PV-2200 (EV-GST2OUT)	Open
__	PV-2201 (EV-GST2DRN)	Open
__	MV-2202	Open
__	PV-2202 (EV-GST2IN)	Open
__	MV-2203	Closed
__	MV-2204	Closed
__	MV-2205	Closed
__	MV-2206	Open
__	MV-2207	Closed
__	PV-2300 (EV-GST3OUT)	Open
__	PV-2301 (EV-GST3DRN)	Open
__	MV-2302	Open
__	PV-2302 (EV-GST3IN)	Open
__	MV-2303	Closed
__	MV-2304	Closed

___

__	MV-2305	Closed
__	MV-2306	Open
__	MV-2400	Open
__	PRV-2400	Fully Open
__	PV-2400 (EV-GST4OUT)	Open
__	MV-2401	Open
__	PRV-2401	Fully Open
__	PV-2401 (EV-GSTRSUP)	Closed
__	MV-2402	Closed
__	MV-2403	Open
__	MV-2404	Open
__	MV-2405	Closed
__	MV-2410	Open
__	MV-2411	Closed
__	MV-2500	Closed
__	MV-2503	Closed
__	PV-2504 (EV-GSC1OUT)	Closed
__	MV-2505	Closed
__	MV-2506	Closed
__	MV-2507	Closed
__	MV-2600	Closed
__	MV-2603	Closed
__	PV-2604 (EV-GSC2OUT)	Closed
__	MV-2605	Closed
__	MV-2606	Closed
__	MV-2607	Closed
__	Comp. #3 Dist. Piece Purge Shutoff	Closed
__	MV-8009	Closed
__	MV-8011	Closed

__ 3. Adjust PRV-2010 for an outlet pressure of 5 psig.
__ 4. Open PV-2013 (EV-GSCMPPURG).
__ 5. Watch PT-GSAESUP on FIX. When it reads 4 to 5 psig, close PV-2013 (EV-GSCMPPURG).

Note: Because of CV-1000 on the Mix Shed to Compressor Suction line, the length of line between this check valve and PV-1709 will have to be backfilled from the Mixing Shed. Any Gas Storage Shed lines not included in this procedure will be purged and backfilled separately. (i.e., the compressor piping, the argon supply line, and the tank sample lines.)

Thermal Conductivity Analyzer Set Up

Name:_____ Date:__/__/__ Time:____:____

This procedure sets up the Gow Mac for use.

__ 1. Power the Mix Shed Gow Mac. The Gow Mac must be warmed up for 24 hours before beginning a mix. Normally, it will never be turned off. MV-1720 and MV-1730 must be open.

__ 2. While not in use, the Gow Mac will have gas from Tank number 4 supplying the reference and sample circuits. To accomplish this, PV–1719 (EV-MSAE2GM) is closed, PV-1720 (EV-MSGG2GM) is closed, PV-1721 (EV-MSGMZERO) is closed, and PV-1722 (EV-MSGMBYP) is closed. These valves are positioned automatically by the Moore Products controller.

__ 3. The sample and reference flow controllers should have set points of 50 cc/min. These setpoints are controlled via the Moore Products controller. The actual gas sampling operation is also controlled by the Moore Products controller.

Gas Heater Set Up

Name:_____ Date:__/__/__ Time:____:____

This procedure prepares the gas heater for use.

__ 1. Power the Beckman controller in the Mix Shed Rack and ensure that the gas heater controller set point is 90 °F. This temperature is controlled locally with the Beckman controller mounted in the Mix Shed Gas Rack.

__ 2. Check the water/glycol solution level in the gas mixing ethane regulator heater. If the water/glycol level is lower than the edge of the inner vessel, mix a 50/50 solution of water/glycol and fill to the edge.

__ 3. Turn on the heater by turning on circuit breakers 2 & 4 of Box PHP/CDF/GS1 on the east side of the Mix Shed.

__ 4. Wait for the water temperature to stabilize at 90 °F before beginning a mix.

NOTES: The Beckman temperature controller remains ON continuously. There is no remote start/stop of this heater control. However, the level of this bath is remotely monitored with level switch, LS-MSGASHTR; and the temperature is remotely monitored with temperature element, TE-MSGASHTR. Low level of the bath and temperature out of range will be detected.

Storage Shed Valve Positioning for Automatic Mixing

Name:_____ Date:__/__/__ Time:____:____

This procedure sets all the manual valves in the Gas Storage Shed to their required positions for automatic 50/50 Argon-Ethane gas mixing. All solenoid and pneumatic valves are automatically positioned with the Moore Products process control systems programmable logic controller. The following manual valves shall not deviate from the indicated positions unless required by an approved procedure.

Gas Storage Shed:

(√)	Valve	Description	Position
__	MV 2000	GAS SHED COMP DISCHARGE	CLOSED/CAPPED
__	MV 2001	GAS SHED COMP DISCHARGE CUT OFF	CLOSED
__	MV 2003	GAS SHED TANK VACUUM SHUTOFF	CLOSED
__	MV 2004	GAS SHED VACUUM SHUTOFF	CLOSED
__	MV 2006	GAS SHED A/E SUPPLY FROM MIX SHED	OPEN
__	MV 2007	GAS SHED COMP SUC PI/PT & FINAL CORR. ISOL.	OPEN
__	MV 2008	GAS SHED COMPRESSOR BYPASS	CLOSED
__	MV 2010	GAS SHED KICKBACK ISOLATION VALVE	OPEN
__	MV 2011	GAS SHED COMPRESSOR DISCHARGE PI ISOL.	OPEN
__	MV 2013	GAS SHED COMPRESSOR DISCHARGE VENT	CLOSED/CAPPED
__	MV 2016	GAS SHED TANK#4 VACUUM LINE	CLOSED
__	MV 2017	GAS SHED PNEUM. SUPPLY WEST PT ISOL	OPEN
__	MV 2018	GAS SHED PNEUM. SUPPLY WEST BANK ISOL.	Alternate Open with MV-2019
__	MV 2019	GAS SHED PNEUM. SUPPLY EAST BANK ISOL.	Alternate Open with MV-2018
__	MV 2020	GAS SHED PNEUM. SUPPLY EAST PT ISOL	OPEN
__	MV 2021	GAS SHED PNEUM. SUPPLY WEST BOTTLE ISOL.	OPEN
__	MV 2022	GAS SHED PNEUM. SUPPLY WEST BOTTLE ISOL.	OPEN
__	MV 2023	GAS SHED PNEUM. SUPPLY WEST BOTTLE ISOL.	OPEN
__	MV 2024	GAS SHED PNEUM. SUPPLY WEST BOTTLE ISOL.	OPEN
__	MV 2025	GAS SHED PNEUM. SUPPLY EAST BOTTLE ISOL.	OPEN
__	MV 2026	GAS SHED PNEUM. SUPPLY EAST BOTTLE ISOL.	OPEN
__	MV 2027	GAS SHED PNEUM. SUPPLY EAST BOTTLE ISOL.	OPEN
__	MV 2028	GAS SHED PNEUM. SUPPLY EAST BOTTLE ISOL.	OPEN
__	MV 2029	GAS SHED PNEUM. SUPPLY PT ISOL.	OPEN
__	MV 2042	GAS SHED NITROGEN BACK-UP BOTTLE ISOL.	OPEN
__	MV 2043	GAS SHED ARGON LINE	OPEN
__	MV 2102	GAS SHED TANK#1 VACUUM LINE	CLOSED
__	MV 2103	GAS SHED TANK#1 VACUUM LINE	CLOSED/CAPPED
__	MV 2104	GAS SHED TANK#1 VACUUM LINE SHUTOFF	CLOSED
__	MV 2105	GAS SHED TANK#1 MONITORING LINE SHUTOFF	OPEN
__	MV 2106	GAS SHED TANK#1 DRAIN LINE PI ISOL.	OPEN
__	MV 2107	GAS SHED TANK#1 VENT	CLOSED/CAPPED
__	MV 2202	GAS SHED TANK#2 VACUUM LINE	CLOSED
__	MV 2203	GAS SHED TANK#2 VACUUM LINE	CLOSED/CAPPED

__	MV 2204	GAS SHED TANK#2 VACUUM LINE SHUTOFF	CLOSED
__	MV 2205	GAS SHED TANK#2 MONITORING LINE SHUTOFF	OPEN
__	MV 2206	GAS SHED TANK#2 DRAIN LINE PI ISOL.	OPEN
__	MV 2207	GAS SHED TANK#2 VENT	CLOSED/CAPPED
__	MV 2208	GAS SHED TANK#2 TCG	CLOSED
__	MV 2302	GAS SHED TANK#3 VACUUM LINE	CLOSED
__	MV 2303	GAS SHED TANK#3 VACUUM LINE	CLOSED/CAPPED
__	MV 2304	GAS SHED TANK#3 VACUUM LINE SHUTOFF	CLOSED
__	MV 2305	GAS SHED TANK#3 MONITORING LINE SHUTOFF	OPEN
__	MV 2306	GAS SHED TANK#3 DRAIN LINE PI ISOL.	OPEN
__	MV 2400	GAS SHED TANK#4 SUPPLY PI/PT ISOL.	OPEN
__	MV 2401	GAS SHED TANK#4 SUPPLY SHUTOFF	OPEN
__	MV 2402	GAS SHED TANK#4 VENT	CLOSED/CAPPED
__	MV 2403	GAS SHED 735' PLAT. SUPPLY SHUTOFF	OPEN
__	MV 2404	GAS SHED 730' PLAT. SUPPLY PI/PT ISOL.	OPEN
__	MV 2405	GAS SHED 730' PLAT. SUPPLY SHUTOFF	OPEN
__	MV 2406	GAS SHED 730' PLAT. SUPPLY FILTERS	OPEN
__	MV 2407	GAS SHED 730' PLAT. SUPPLY FILTERS	OPEN
__	MV 2408	GAS SHED 730' PLAT. SUPPLY FILTERS	OPEN
__	MV 2409	GAS SHED 730' PLAT. SUPPLY FILTERS	OPEN
__	MV 2410	GAS SHED TANK#4 VACUUM LINE	CLOSED
__	MV 2411	GAS SHED TANK#4 SAMPLE LINE SHUTOFF	OPEN
__	MV 2412	GS TANK#4 SAMPLE LINE TO MS SHUTOFF	OPEN
__	MV 2503	GAS SHED COMPRESSOR#1 VACUUM	CLOSED
__	MV 2505	GAS SHED COMPRESSOR#1 SUCTION SHUTOFF	OPEN
__	MV 2506	GAS SHED COMPRESSOR#1 VACUUM	CLOSED
__	MV 2507	GAS SHED COMPRESSOR#1 LOADER VALVE	OPEN
__	MV 2603	GAS SHED COMPRESSOR#2 VACUUM	CLOSED
__	MV 2605	GAS SHED COMPRESSOR#2 SUCTION SHUTOFF	OPEN
__	MV 2606	GAS SHED COMPRESSOR#2 VACUUM	CLOSED
__	MV 2607	GAS SHED COMPRESSOR#2 LOADER VALVE	CLOSED
__	MV 2700	GAS SHED AR/CO2 TRAILER SUPPLY	OPEN
__	MV 2701	GAS SHED AR/CO2 TRAILER SUPPLY	OPEN
__	MV 2702	GAS SHED AR/CO2 TRAILER SUPPLY PT ISOL.	OPEN
__	MV 2703	GAS SHED AR/CO2 PI-2700 ISOLATION VALVE	OPEN

Mixing Shed Valve Positioning for Automatic Mixing

Name:_____ Date:__/__/__ Time:____:____

This procedure sets all the manual valves in the Gas Mixing Shed to their required positions for automatic 50/50 Argon-Ethane gas mixing. All solenoid and pneumatic valves are automatically positioned with the Moore Products process control systems programmable logic controller. The following manual valves shall not deviate from the indicated positions unless required by an approved procedure.

Mixing Shed:

(√)	Valve	Description	Position
__	MV 1100	MS ETHANE TR.#1 BLEED	CLOSED/CAPPED
__	MV 1102	MS ETHANE TR.#1 GAGE ISOL.	OPEN
__	MV 1103	MS ETHANE TR.#1 VENT	CLOSED
__	MV 1104	MS ETHANE TR.#1 VACUUM HEADER	CLOSED
__	MV 1105	MS ETHANE TR.#1 SAMPLE	CLOSED/CAPPED
__	MV 1106	MS ETHANE TR.#1 PT ISOLATION	OPEN
__	MV 1107	MS ETHANE TR.#1 STRAINER BYPASS	CLOSED
__	MV 1108	MS ETHANE TR.#1 STRAINER VENT	CLOSED/CAPPED
__	MV 1200	MS ETHANE TR.#2 BLEED	CLOSED/CAPPED
__	MV 1202	MS ETHANE TR.#2 GAGE ISOL.	OPEN
__	MV 1203	MS ETHANE TR.#2 SAMPLE	CLOSED
__	MV 1204	MS ETHANE TR.#2 VACUUM HEADER	CLOSED
__	MV 1205	MS ETHANE TR.#2 SAMPLE	CLOSED/CAPPED
__	MV 1206	MS ETHANE TR.#2 PT ISOLATION	OPEN
__	MV 1207	MS ETHANE TR.#2 STRAINER BYPASS	CLOSED
__	MV 1208	MS ETHANE TR.#2 STRAINER VENT	CLOSED/CAPPED
__	MV 1300	MS ETHANE TR.#3 BLEED	CLOSED/CAPPED
__	MV 1302	MS ETHANE TR.#3 GAGE ISOL.	OPEN
__	MV 1303	MS ETHANE TR.#3 BLEED	CLOSED
__	MV 1304	MS ETHANE TR.#3 VACUUM HEADER	CLOSED
__	MV 1305	MS ETHANE TR.#3 SAMP.	CLOSED/CAPPED
__	MV 1306	MS ETHANE TR.#3 PT ISOLATION	OPEN
__	MV 1307	MS ETHANE TR.#3 STRAINER BYPASS	CLOSED
__	MV 1308	MS ETHANE TR.#3 STRAINER VENT	CLOSED/CAPPED
__	MV 1400	MS ETHANE TR.#4 BLEED	CLOSED/CAPPED
__	MV 1401	MS ETHANE TR.#4 SUPPLY ISOL.	CLOSED
__	MV 1402	MS EHTANE TR.#4 PRESSURE GAGE ISOL.	CLOSED
__	MV 1403	MS ETHANE TR.#4 BLEED	CLOSED/CAPPED
__	MV 1404	MS ETHANE TR.#4 SAMP.	CLOSED
__	MV 1405	MS ETHANE TR.#4 VACUUM	CLOSED
__	MV 1406	MS ETHANE TR.#4 COMP.SUC.	CLOSED
__	MV 1407	MS ETHANE TR.#4 COMP.DISC.	CLOSED

__	MV 1500	MS ETHANE TR.#5 BLEED	CLOSED/CAPPED
__	MV 1501	MS ETHANE TR.#5 SUPPLY ISOL.	CLOSED
__	MV 1502	MS ETHANE TR.#5 PRESSURE GAGE ISOL.	CLOSED
__	MV 1503	MS ETHANE TR.#5 BLEED	CLOSED/CAPPED
__	MV 1504	MS ETHANE TR.#5 SAMP.	CLOSED
__	MV 1505	MS ETHANE TR.#5 VACUUM	CLOSED
__	MV 1506	MS ETHANE TR.#5 COMP.SUC.	CLOSED
__	MV 1507	MS ETHANE TR.#5 COMP.DISC.	CLOSED
__	MV 1600	MS 95/5 TRAILER SLOT#6 TO PT 1600	OPEN
__	MV 1601	MS 95/5 TRAILER SLOT#6 VENT	CLOSED
__	MV 1602	MS 95/5 TRAILER SLOT#6 SHUT-OFF	Alternate Open with MV-1605
__	MV 1603	MS 95/5 TRAILER SLOT#7 TO PT 1601	OPEN
__	MV 1604	MS 95/5 TRAILER SLOT#7 VENT	CLOSED
__	MV 1605	MS 95/5 TRAILER SLOT#7 SHUT-OFF	Alternate Open with MV-1602
__	MV 1606	MS PI-1606 ISOLATE, Ar/CO2 line	OPEN
__	MV 1700	MS H2S ADSORBER ETHANE IN	OPEN
__	MV 1701	MS TANK #4 SAMPLE LINE TO GOW MAC	OPEN
__	MV 1702	MS H2S ADSORBER ETHANE VENT	OPEN
__	MV 1705	MS H2S ADSORBER GAGE ISOL.	OPEN
__	MV 1706	MS H2S ADSORBER(NIT.IN)	OPEN
__	MV 1707	MS H2S Adsorber Bypass	CLOSED
__	MV 1708	MS VACUUM PUMP PURGE SUPPLY	OPEN
__	MV 1711	MS VACUUM GAGE ISOL.	OPEN
__	MV 1713	MS VACUUM MANIFOLD	CLOSED
__	MV 1714	MS F-1713 Oil Drain, supplied with oil vapor filter	Self-positioning with Float
__	MV 1715	MS VACUUM GAGE ISOL.	OPEN
__	MV 1716	MS VACUUM MANIFOLD	CLOSED
__	MV 1718	MS VACUUM MANIFOLD	CLOSED
__	MV 1720	MS Gow Mac Reference Port Shutoff	OPEN
__	MV 1721	MS H2S Adsorber Supply	OPEN
__	MV 1722	MS H2S Adsorber Exit	OPEN
__	MV 1724	MS VAC./FLOW CONTROL RK	CLOSED
__	MV 1730	MS Gow Mac Sample Port Shutoff	OPEN
__	MV 1731	MS VAC./FLOW CONTROL RK	CLOSED
__	MV 1732	MS VAC./FLOW CONTROL RK	CLOSED
__	MV 1734	MS VAC./FLOW CONTROL RK	CLOSED
__	MV 1740	MS PT-MSAFCSUP ISOLATE	OPEN
__	MV 1741	MS PT-MSEFCSUP ISOLATE	OPEN
__	MV 1750	MS Oil Filtration Supply	OPEN
__	MV 1751	MS Oil Filtration Exit	OPEN
__	MV 1752	MS Oil Filtration Bypass Valve	CLOSED
__	MV 1753	MS Oil Filtration Vent Valve	CLOSED
__	MV 1754	MS Oil Reservoir Isolation Valve	OPEN

__	MV 1755	MS Oil Drain Valve	CLOSED
__	MV 1756	MS Oil Reservoir Vent Valve	CLOSED
__	MV 1757	MS Oil Reservoir DPT Isolation, Block & Bleed	OPEN
__	MV 1758	MS Oil Reservoir DPT Isolation, Block & Bleed	OPEN
__	MV 1759	MS Oil Reservoir DPT Equalizer, Block & Bleed	CLOSED
__	MV 1760	MS Oil Filtration DPT Isolation, Block & Bleed	OPEN
__	MV 1761	MS Oil Filtration DPT Isolation, Block & Bleed	OPEN
__	MV 1762	MS Oil Filtration DPT Equalizer, Block & Bleed	CLOSED
__	MV 1800	MS PT-MSETHTR ISOLATE	OPEN
__	MV 1802	MS PI-1800 GAUGE ISOLATION	OPEN
__	MV 1900	MS LAr DEW VAPOR TOP FILL	CLOSED
__	MV 1901	MS LAr DEWAR DPT, DPI ISOL.	OPEN
__	MV 1902	MS LAr DEWAR DPT, DPI ISOL.	OPEN
__	MV 1903	MS LAr DEW VENT	CLOSED
__	MV 1904	MS LAr DEW VAPOR SHUT OFF	OPEN
__	MV 1905	MS LAr DEW FILL LINE STRAINER VENT	CLOSED
__	MV 1906	MS LAr DEW BOT FILL	CLOSED
__	MV 1907	MS LAr DEW PRESS. BUILD	OPEN
__	MV 1908	MS LAr DEW VAC.PUMP ISOL.	CLOSED/CAPPED
__	MV 1909	MS LAr DEW GAGE ISOL.	OPEN
__	MV 1910	MS LAr DEW FULL TRICOCK	CLOSED
__	MV 1911	MS LAr DEW GAGE EQUALIZER	CLOSED
__	MV 1912	MS LAr DEW LIQUID WITHDRAWAL	OPEN
__	MV 1913	MS LAr DEW PRV-1902 ISOL.	OPEN
__	MV 1914	MS LAr DEW PRV-1902 ISOL.	OPEN
__	MV 1915	MS LAr DEW PRV-1903 ISOL.	OPEN
__	MV 1916	MS LAr DEW PRV-1903 ISOL.	OPEN
__	MV 1917	MS LAr DEW PRESS. BUILDER VENT	CLOSED/CAPPED
__	MV 1918	MS LAr DEW GAGE ISOL.	OPEN
__	MV 1919	MS LAr DEW SAFETY VALVE SELECT	OPEN
__	MV 1920	MS LAr DEWAR PI-1903 ISOLATE	OPEN
__	MV 1921	MS PI-1901 ISOLATE	OPEN
__	MV 1925	MS Argon Pneumatic Supply	OPEN
__	MV 1926	MS Argon Pneumatic PT/PI Isolation	OPEN
__	MV 1927	MS Argon Pneumatic Vent Valve	CLOSED/CAPPED
__	MV 1928	MS Argon Pneumatic Backup Isolation	OPEN
__	MV 1929	MS Argon Line Isolation to CDF	OPEN
__	MV 1930	MS Argon Supply Line Vent	CLOSED/CAPPED

___

Ethane Filter Change

Name:_____ Date:__/__/__ Time:____:____

The ethane filters, F-1703 and F-1704 should last months, but will eventually need to be changed. The need to change will be signaled by a decrease in available pressure at the ethane flow control station as read by PT-MSEFCSUP. The following procedure details the evacuation and argon backfilling necessary to change a filter.

__ 1. The valves associated with the filter and flow control station are to be positioned as follows:

(√)	Valve	Position
__	PV-1708 (EV-MSADSOUT)	Closed
__	PV-1725 (EV-MSAFCOUT1)	Closed
__	PV-1728 (EV-MSAFCIN1)	Open
__	PV-1730 (EV-MSAFCIN2)	Closed
__	PV-1733 (EV-MSEFCOUT1)	Closed
__	PV-1737 (EV-MSEFCIN1)	Open
__	PV-1739 (EV-MSEFCIN2)	Closed
__	MV-1724	Closed
__	MV-1731	Closed
__	MV-1732	Closed
__	MV-1734	Closed

__ 2. Open FCV-MSEFC1 and FCV-MSAFC1 by placing the appropriate Hastings Power Supply command switches in the open position.
__ 3. Initially, the valves at the vacuum pump should be in the following positions:

(√)	Valve	Position
__	MV-1718	Closed
__	MV-1716	Closed
__	PV-1717 (EV-MSVACMAN)	Closed
__	PV-1712 (EV-MSVACPISO)	Closed
__	PV-1714 (EV-MSVACMBYP)	Closed
__	MV-1713	Closed
__	MV-1715	Open
__	MV-1711	Open

__ 4. Open MV-1732 followed by MV-1718.
__ 5. Open PV-1714 (EV-MSVACMBYP) to blow down any residual pressure in the vacuum manifold.
__ 6. Close PV-1714 (EV-MSVACMBYP) as soon as PI-1700 and PT-MSVACM1 read 0 psig.
__ 7. Start the vacuum pump.
__ 8. Open PV-1712 (EV-MSVACPISO).
__ 9. When the line has been pumped to 100 microns or less, close PV-1712 (EV-MSVACPISO).
__ 10. Open PV-1901 (EV-MSARSUP) to allow argon gas into the argon circuit.
__ 11. Crack open MV-1724 to fill the now evacuated lines with argon.
__ 12. Carefully watch PI-1700 (and PT-MSVACM1) and close MV-1724 as soon as any pressure greater than 0 psig is reached. Next, open PV-1714 (EV-

___

MSVACMBYP) to bleed off the pressure. Then, close again PV-1714 (EV-MSVACMBYP).

__ 13. Now that the portion of the ethane circuit which includes the two filters is filled with argon, disassemble the filter housings, and replace the cartridges. Model numbers for the cartridges are listed in the CDF Gas Systems Valve and Instrument List. Reassemble the housings.
__ 14. Open PV-1712 (EV-MSVACPISO) to apply a vacuum to the piping and filter.
__ 15. Once 100 microns is reached, close MV-1718 and MV-1732.
__ 16. Close PV-1712 (EV-MSVACPISO) and turn off the vacuum pump.
__ 17. Open PV-1708 (EV-MSADSOUT) to let ethane fill the now evacuated filter and supply line.
__ 18. Return FCV-MSEFC1 and FCV-MSAFC1 to the auto position.
__ 19. Close PV-1728 (EV-MSAFCIN1) and PV-1901 (EV-MSARSUP).
__ 20. Close PV-1737 (EV-MSEFCIN1) and PV-1708 (EV-MSADSOUT).

___

Ethane Trailer No. 1 Disconnect

Name:_____ Date:__/__/__ Time:____:____

This procedure disconnects ethane trailer no. 1. Trailer disconnection involves reducing the pressure in the fill line and unhooking the flex hose and safety valve (SV-1050) assembly.

__ 1. The valves associated with ethane trailer no. 1 should be positioned as follows:

(√)	Valve	Position
__	MV-1100	Closed (and capped)
__	MV-1102	Open
__	MV-1103	Closed
__	MV-1104	Closed
__	MV-1105	Closed (and capped)
__	MV-1106	Open
__	MV-1107	Closed
__	MV-1108	Closed
__	PV-1100 (EV-MSTR1VLV)	Closed
__	PV-1107 (EV-MSTR1SUP)	Closed

__ 2. Close the trailer supply valve on the back of ethane trailer no. 1.
__ 3. Open PV-1100 (EV-MSTR1VLV) via DMACS.
__ 4. Slowly open MV-1103 to reduce the pressure in the fill line to atmospheric.
__ 5. Check the pressure on PI-1100.
__ 6. Close MV-1103 when reading 0 psig on PI-1100.
__ 7. Close PV-1100 (EV-MSTR1VLV). Un-cap and open MV-1100 momentarily to be sure no pressure remains upstream of PV-1100. Close MV-1100 and cap it.
__ 8. Unhook the flex hose/safety valve assembly from the trailer and cap the ends of the trailer, safety valve assembly, and the flex hose/PV-1100.
__ 9. Remove the grounding wire.
__ 10. Close the trailer tube manifold valves.
__ 11. When the trailer is removed, remember to close the trailer access doors once the driver has cleared the trailer area.

___

Ethane Trailer No. 2 Disconnect

Name:_____ Date:__/__/__ Time:____:____

This procedure disconnects ethane trailer no. 2. Trailer disconnection involves reducing the pressure in the fill line and unhooking the flex hose and safety valve (SV-1050) assembly.

__ 1. The valves associated with ethane trailer no. 2 should be positioned as follows:

(√)	Valve	Position
__	MV-1200	Closed (and capped)
__	MV-1202	Open
__	MV-1203	Closed
__	MV-1204	Closed
__	MV-1205	Closed (and capped)
__	MV-1206	Open
__	MV-1207	Closed
__	MV-1208	Closed
__	PV-1200 (EV-MSTR2VLV)	Closed
__	PV-1207 (EV-MSTR2SUP)	Closed

__ 2. Close the trailer supply valve on the back of ethane trailer no. 2.
__ 3. Open PV-1200 (EV-MSTR2VLV) via DMACS.
__ 4. Slowly open MV-1203 to reduce the pressure in the fill line to atmospheric.
__ 5. Check the pressure on PI-1200.
__ 6. Close MV-1203 when reading 0 psig on PI-1200.
__ 7. Close PV-1200 (EV-MSTR2VLV). Un-cap and open MV-1200 momentarily to be sure no pressure remains upstream of PV-1200. Close MV-1200 and cap it.
__ 8. Unhook the flex hose/safety valve assembly from the trailer and cap the ends of the trailer, safety valve assembly, and the flex hose/PV-1200.
__ 9. Remove the grounding wire.
__ 10. Close the trailer tube manifold valves.
__ 11. When the trailer is removed, remember to close the trailer access doors once the driver has cleared the trailer area.

___

Ethane Trailer No. 3 Disconnect

Name:_____ Date:__/__/__ Time:____:____

This procedure disconnects ethane trailer no. 3. Trailer disconnection involves reducing the pressure in the fill line and unhooking the flex hose and safety valve (SV-1050) assembly.

__ 1. The valves associated with ethane trailer no. 3 should be positioned as follows:

(√)	Valve	Position
__	MV-1300	Closed (and capped)
__	MV-1302	Open
__	MV-1303	Closed
__	MV-1304	Closed
__	MV-1305	Closed (and capped)
__	MV-1306	Open
__	MV-1307	Closed
__	MV-1308	Closed
__	PV-1300 (EV-MSTR3VLV)	Closed
__	PV-1307 (EV-MSTR3SUP)	Closed

__ 2. Close the trailer supply valve on the back of ethane trailer no. 3.
__ 3. Open PV-1300 (EV-MSTR3VLV) via DMACS.
__ 4. Slowly open MV-1303 to reduce the pressure in the fill line to atmospheric.
__ 5. Check the pressure on PI-1300.
__ 6. Close MV-1303 when reading 0 psig on PI-1300.
__ 7. Close PV-1300 (EV-MSTR3VLV). Un-cap and open MV-1300 momentarily to be sure no pressure remains upstream of PV-1300. Close MV-1300 and cap it.
__ 8. Unhook the flex hose/safety valve assembly from the trailer and cap the ends of the trailer, safety valve assembly, and the flex hose/PV-1300.
__ 9. Remove the grounding wire.
__ 10. Close the trailer tube manifold valves.
__ 11. When the trailer is removed, remember to close the trailer access doors once the driver has cleared the trailer area.

4.0 Required Training and Authorized Training Personnel.

There is no prerequisite training for this procedure.

Authorized training personnel are listed below:
Gas Systems Manager
Gas Systems Engineer

Both are qualified by experience in the design / implementation of the CDF Gas systems.

5.0 Training Materials.

Training materials include this procedure only. Supporting documentation is provided in the CDF Gas Systems Safety Report.

6.0 List of Trained People for this procedure.

The list of trained people for this procedure will exist in written form in the CDF Department copy of this procedure.

Name	Date Trained	Approval Signature by Training Personnel
Bruce Vollmer		
Dean Beckner		
Mike Starr		
Dave Haynie		
Casey Cahill		