Worksheet

Node: 1. (HP Gas) Production Header through High Pressure Separator (V-101) to Gas Export Pipeline

Drawings: D-254-002-002; D-254-002-005

Design Conditions/Parameters: MAWP = 1200 psig @ 300 F

Equipment ID:

Deviation: 1. More Pressure

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Production header pressure operates above 1200 psig.	1. Potential overpressure of V-101. Potential loss of mechanical integrity. Potential rupture of High Pressure Separator resulting in large release of hydrocarbons and potential fire or explosion.	4	3	3	1. Relief valve PSV-101 opens to flare 2. PT-101D high pressure shutdown closes HP separator inlet valve SDV-101. 3. Control valve PV-101B will open to flare.	3	4	3	3	0	0	0	0		
2. External fire in the vicinity of HP Separator V-101.	1. Potential overpressure of V-101. Potential loss of mechanical integrity. Potential rupture of High Pressure Separator resulting in large release of hydrocarbons and escalation of fire or explosion.	4	3	3	1. Relief valve PSV-101 opens to flare 2. Fire detection system allowing time for personnel evacuation 3. PT-101D high pressure shutdown closes HP separator inlet valve SDV-101. 4. Control valve PV-101B will open to flare. No credit taken for this IPL due to inadequate sizing.	2	3	2	2	0	0	0	0		

Node: 1. (HP Gas) Production Header through High Pressure Separator (V-101) to Gas Export Pipeline

Drawings: D-254-002-002; D-254-002-005

Design Conditions/Parameters: MAWP = 1200 psig @ 300 F

Equipment ID:

Deviation: 2. Less Pressure

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Production header pipeline leak or rupture (due to vehicle impact) upstream of SDV-101.	1. Potential breach of high pressure pipeline with subsequent pressure reduction to HP Separator M-101. Potential hydrocarbon release to environmental and subsequent impacts. Potential fire/explosion.	4	3	2	1. PT-101D low pressure shutdown mitigates hazard by closing SDV-101. 2. Automated low pressure shutdown upstream of the production header.	1	2	1	0	0	0	0	0		

Node: 1. (HP Gas) Production Header through High Pressure Separator (V-101) to Gas Export Pipeline

Drawings: D-254-002-002; D-254-002-005

Design Conditions/Parameters: MAWP = 1200 psig @ 300 F

Equipment ID:

Deviation: 3. More Temperature

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. No credible causes															

Node: 1. (HP Gas) Production Header through High Pressure Separator (V-101) to Gas Export Pipeline

Drawings: D-254-002-002; D-254-002-005

Design Conditions/Parameters: MAWP = 1200 psig @ 300 F

Equipment ID:

Deviation: 4. Less Temperature

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. No credible causes - Auto-refrigeration of gas flashing across PV-101A not expected															

Node: 1. (HP Gas) Production Header through High Pressure Separator (V-101) to Gas Export Pipeline
Drawings: D-254-002-002; D-254-002-005
Design Conditions/Parameters: MAWP = 1200 psig @ 300 F
Equipment ID:
Deviation: 4. Less Temperature

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
to result in safety concerns.															

Node: 1. (HP Gas) Production Header through High Pressure Separator (V-101) to Gas Export Pipeline
Drawings: D-254-002-002; D-254-002-005
Design Conditions/Parameters: MAWP = 1200 psig @ 300 F
Equipment ID:
Deviation: 5. More Level

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Failure of control loop LIC-101 such that liquid outlet valve is too much closed.	1. Potential overfill of the High Pressure Separator M-101 with liquid flow to the Gas Export Pipeline. Potential for Off-Spec product.	0	0	1	1. High level shutdown LT-101B closes inlet valve SDV-101 2. Operator response to high level alarm LT-101A - not independent from control loop failure	3	0	0	1	2	0	0	0		
2. Failure of shutdown valve SDV-102A to the closed position.	1. Potential overfill of the High Pressure Separator M-101 with liquid flow to the Gas Export Pipeline. Potential for Off-Spec product.	0	0	1	1. High level shutdown LT-101B closes inlet valve SDV-101 2. Operator response to high level alarm LT-101A	3	0	0	1	1	0	0	0		
3. Slug greater than 90 bbl from production header.	1. Potential overfill of the High Pressure Separator M-101 with liquid flow to the Gas Export Pipeline. Potential for Off-Spec product.	0	0	1	1. Operator response to high level alarm LT-101A 2. High level shutdown LT-101B closes inlet valve SDV-101	3	0	0	1	1	0	0	0		

Node: 1. (HP Gas) Production Header through High Pressure Separator (V-101) to Gas Export Pipeline
Drawings: D-254-002-002; D-254-002-005
Design Conditions/Parameters: MAWP = 1200 psig @ 300 F
Equipment ID:
Deviation: 6. Less Level

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Failure of control loop LIC-101A such that valve is too much open	1. Potential for gas blowby into the Low Pressure Separator V-102. Potential for overpressure of Low Pressure Separator. Potential for loss of mechanical integrity. Potential for rupture of vessel or associated piping. Potential release of flammable materials. Potential fire/explosion.	5	3	4	1. Relief valve PSV-102, which is sized for gas blow-by 2. Low level shutdown LT-101B closes low pressure separator inlet SDV-102A 3. Operator response to low level alarm LT-101A - not independent from control loop failure 4. High pressure shutdown PT-102B closes SDV-102A. No credit taken for this IPL due to shared final element with LT-101B low level shutdown.	3	5	3	4	0	0	0	0		
2. Inadvertant opening of bypass around control valve LV-101A	1. Potential for gas blowby into the Low Pressure Separator V-102. Potential for overpressure of Low Pressure Separator. Potential for loss of mechanical integrity. Potential for rupture of vessel or associated piping. Potential release of flammable materials. Potential fire/explosion.	5	3	4	1. Relief valve PSV-102, which is sized for gas blow-by 2. Low level shutdown LT-101B closes low pressure separator inlet SDV-102A 3. Operator response to low level alarm LT-101A 4. High pressure shutdown PT-102B closes SDV-102A. No credit taken for this IPL due to shared final	2	4	2	3	0	0	0	0		

Node: 1. (HP Gas) Production Header through High Pressure Separator (V-101) to Gas Export Pipeline
Drawings: D-254-002-002; D-254-002-005
Design Conditions/Parameters: MAWP = 1200 psig @ 300 F
Equipment ID:
Deviation: 6. Less Level

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
					element with LT-101B low level shutdown.										
3. Failure of control loop PIC-101A causing PV-101A to fail too closed.	1. Operability issue, no safety hazard identified.	0	0	1	1. Relief valve PSV-102, which is sized for gas blow-by 2. Low level shutdown LT-101B closes low pressure separator inlet SDV-102A 3. Operator response to low level alarm LT-101A 4. High pressure shutdown PT-102B closes SDV-102A. No credit taken for this IPL due to shared final element with LT-101B low level shutdown.	3	0	0	1	0	0	0	0		

Node: 1. (HP Gas) Production Header through High Pressure Separator (V-101) to Gas Export Pipeline
Drawings: D-254-002-002; D-254-002-005
Design Conditions/Parameters: MAWP = 1200 psig @ 300 F
Equipment ID:
Deviation: 7. More Flow

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Production header pipeline breach causing excess flow to be routed to the export gas pipeline.	1. No credible consequences identified - PV-104A must fail open in order to introduce excess pressure into the export gas pipeline.														

Node: 1. (HP Gas) Production Header through High Pressure Separator (V-101) to Gas Export Pipeline
Drawings: D-254-002-002; D-254-002-005
Design Conditions/Parameters: MAWP = 1200 psig @ 300 F
Equipment ID:
Deviation: 8. No/Less Flow

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. No new causes identified.															

Node: 1. (HP Gas) Production Header through High Pressure Separator (V-101) to Gas Export Pipeline
Drawings: D-254-002-002; D-254-002-005
Design Conditions/Parameters: MAWP = 1200 psig @ 300 F
Equipment ID:
Deviation: 9. Reverse Flow

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Production gas pipeline breach causing HP Separator M-101 gas and fluids to reverse flow to common line breach.	1. Potential for rapid de-pressurization of HP Separator M-101. Potential escalation of line breach scenario. Potential release of flammable material resulting in fire/explosion.	4	1	2	1. Production manifold low pressure shutdown would close manifold isolation valves to limit inventory release.	1	2	0	0	0	0	0	0	2. Consider adding a check valve to the inlet pipeline to HP Separator M-101 to prevent reverse flow through the pipeline.	
2. Failure of control loop PIC-104A causing PV-104A to fail too closed.	1. Potential loss of production. Commercial issues, no safety hazards identified.	0	0	1	1. Operator response to TT-104 high temperature alarm. 2. Operator response to PT-102A high	3	0	0	1	0	0	0	0		

Node: 1. (HP Gas) Production Header through High Pressure Separator (V-101) to Gas Export Pipeline
Drawings: D-254-002-002; D-254-002-005
Design Conditions/Parameters: MAWP = 1200 psig @ 300 F
Equipment ID:
Deviation: 9. Reverse Flow

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
					pressure alarm. 3. PT-104C causes shutoff of C-104.										
3. Inadvertent closure of SDV-104B.	1. Potential loss of production. Commercial issues, no safety hazards identified.	0	0	1	1. PT-104C causes shutoff of C-104. 2. Operator response to PT-102A high pressure alarm. 3. Operator response to TT-104 high temperature alarm.	3	0	0	1	0	0	0	0		

Node: 1. (HP Gas) Production Header through High Pressure Separator (V-101) to Gas Export Pipeline
Drawings: D-254-002-002; D-254-002-005
Design Conditions/Parameters: MAWP = 1200 psig @ 300 F
Equipment ID:
Deviation: 10. Misdirected Flow

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Failure of control PV-101B such that valve is too much open	1. Unintentional flaring. Loss of product. Potential small release of hydrocarbons to environment.	0	1	1	1. Operator intervention based on high flow alarm FAH-101. 2. Visual cues for operator at the flare (excess flaring).	3	0	1	1	2	0	0	0		

Node: 1. (HP Gas) Production Header through High Pressure Separator (V-101) to Gas Export Pipeline
Drawings: D-254-002-002; D-254-002-005
Design Conditions/Parameters: MAWP = 1200 psig @ 300 F
Equipment ID:
Deviation: 11. Other Than Flow

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. No credible causes identified															

Node: 1. (HP Gas) Production Header through High Pressure Separator (V-101) to Gas Export Pipeline
Drawings: D-254-002-002; D-254-002-005
Design Conditions/Parameters: MAWP = 1200 psig @ 300 F
Equipment ID:
Deviation: 12. Composition

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Additional wellheads added to the common production header.	1. Potential introduction of sour gas in the flare system and reaction with water vapor. Potential release of acid rain and environmental impacts.	0	1	2	1. Certificate of incoming production gas from production gas producers. 2. Routine sampling by supplier of incoming gas.	1	0	0	0	0	0	0	0		
2. Inadvertent shutdown of wellheads.	1. Potential introduction of sour gas in the flare system and reaction with water vapor. Potential release of acid rain and environmental impacts.	0	1	2	1. Certificate of incoming production gas from production gas producers. 2. Routine sampling by supplier of incoming gas.	1	0	0	0	0	0	0	0		

Node: 2. (Liquid Stream) High Pressure Separator (V-101) to Low Pressure Separator (V-102)
Drawings: D-254-002-002; D-254-002-003
Design Conditions/Parameters: MAWP = 75 psig @ 300 F
Equipment ID:
Deviation: 1. More Pressure

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. External fire in the vicinity of Low Pressure Separator M-102	1. Potential overpressure of M-102. Potential loss of mechanical integrity. Potential rupture of Low Pressure Separator resulting in large release of hydrocarbons and escalation of fire or explosion. The team notes the spacing of the equipment is large enough to reduce flame impingement from one vessel to another vessel.	4	3	3	1. Relief valve PSV-102 opens to flare 2. Fire detection system allowing time for personnel evacuation 3. PT-102B high pressure shutdown closes SDV-101 and SDV-102A. 4. Operator response to PT-102A high pressure alarm. 5. Fire protection and insulation due to vessel support structure.	2	3	2	2	0	0	0	0		

Node: 2. (Liquid Stream) High Pressure Separator (V-101) to Low Pressure Separator (V-102)
Drawings: D-254-002-002; D-254-002-003
Design Conditions/Parameters: MAWP = 75 psig @ 300 F
Equipment ID:
Deviation: 2. Less Pressure

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Failure of control loop LIC-101 causing LV-101 to fail too closed.	1. Potential for vacuum in LP Separator M-102. Potential introduction of air into LP Separator. No safety hazard identified - vessel is rated for full vacuum and no ignition sources present.														
2. Inadvertent closure of SDV-102A.	1. Potential for vacuum in LP Separator M-102. Potential introduction of air into LP Separator. No safety hazard identified - vessel is rated for full vacuum and no ignition sources present.														

Node: 2. (Liquid Stream) High Pressure Separator (V-101) to Low Pressure Separator (V-102)
Drawings: D-254-002-002; D-254-002-003
Design Conditions/Parameters: MAWP = 75 psig @ 300 F
Equipment ID:
Deviation: 3. More Temperature

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Failure of temperature control on H105 resulting in 350 degree spillback gas to M102.	1. No significant safety hazards identified.														

Node: 2. (Liquid Stream) High Pressure Separator (V-101) to Low Pressure Separator (V-102)
Drawings: D-254-002-002; D-254-002-003
Design Conditions/Parameters: MAWP = 75 psig @ 300 F
Equipment ID:
Deviation: 4. Less Temperature

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. No credible causes - Auto-refrigeration of gas flashing across PV-101A.	1. No significant safety hazards identified.														

Node: 2. (Liquid Stream) High Pressure Separator (V-101) to Low Pressure Separator (V-102)
Drawings: D-254-002-002; D-254-002-003
Design Conditions/Parameters: MAWP = 75 psig @ 300 F
Equipment ID:
Deviation: 5. More Level

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause	Unmitigated Risk Rankings	Mitigated	Mitigated Risk Rankings	Recommendations	Remarks

						e Likelihood	Safety	Environment	Asset	Likelihood	Safety	Environment	Asset		
1. Failure of control loop LIC-102A such that FV-103C is too much closed.	1. Potential overfill of the Low Pressure Separator M-102. Potential liquid carryover to Export Gas Compressor C104, potential compressor damage. potential fire/explosion, Potential for fire, explosion, environmental impacts, equipment damage and personnel injury.	4	2	2	1. High level shutdown LT-102B closes SDV 102A and SDV-104A. 2. Operator response to high level alarm LT-102A - not independent from control loop failure 3. Operator response to PT-105A low seal gas pressure alarm. 4. Operator response to FT-103B low flow alarm.	3	4	2	2	0	0	0	0		
2. Failure of shutdown valve SDV102B to the closed position.	1. Potential overfill of the Low Pressure Separator M-102. Potential liquid carryover to Export Gas Compressor C104, potential compressor damage. potential fire/explosion, Potential for fire, explosion, environmental impacts, equipment damage and personnel injury.	4	2	2	1. High level shutdown LT-102B closes SDV 102A and SDV-104A. 2. Operator response to high level alarm LT-102A. 3. Operator response to PT-105A low seal gas pressure alarm. 4. Operator response to FT-103B low flow alarm.	3	4	2	2	0	0	0	0		

Node: 2. (Liquid Stream) High Pressure Separator (V-101) to Low Pressure Separator (V-102)
Drawings: D-254-002-002; D-254-002-003
Design Conditions/Parameters: MAWP = 75 psig @ 300 F
Equipment ID:
Deviation: 6. Less Level

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. No credible causes identified. Low/no flow/level scenarios to export pump addressed in Node 4.															

Node: 2. (Liquid Stream) High Pressure Separator (V-101) to Low Pressure Separator (V-102)
Drawings: D-254-002-002; D-254-002-003
Design Conditions/Parameters: MAWP = 75 psig @ 300 F
Equipment ID:
Deviation: 7. More Flow

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. No credible causes identified															

Node: 2. (Liquid Stream) High Pressure Separator (V-101) to Low Pressure Separator (V-102)
Drawings: D-254-002-002; D-254-002-003
Design Conditions/Parameters: MAWP = 75 psig @ 300 F
Equipment ID:
Deviation: 8. No/Less Flow

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. No credible causes identified															

Node: 2. (Liquid Stream) High Pressure Separator (V-101) to Low Pressure Separator (V-102)
Drawings: D-254-002-002; D-254-002-003
Design Conditions/Parameters: MAWP = 75 psig @ 300 F
Equipment ID:
Deviation: 9. Misdirected Flow

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		

Node: 2. (Liquid Stream) High Pressure Separator (V-101) to Low Pressure Separator (V-102)
Drawings: D-254-002-002; D-254-002-003
Design Conditions/Parameters: MAWP = 75 psig @ 300 F
Equipment ID:
Deviation: 9. Misdirected Flow

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. No credible causes identified															

Node: 2. (Liquid Stream) High Pressure Separator (V-101) to Low Pressure Separator (V-102)
Drawings: D-254-002-002; D-254-002-003
Design Conditions/Parameters: MAWP = 75 psig @ 300 F
Equipment ID:
Deviation: 10. Reverse Flow

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. No credible causes identified. Reverse flow to LP Separator M-102 due to export pump P-103 shutoff addressed in Node 4 - Reverse Flow.															

Node: 2. (Liquid Stream) High Pressure Separator (V-101) to Low Pressure Separator (V-102)
Drawings: D-254-002-002; D-254-002-003
Design Conditions/Parameters: MAWP = 75 psig @ 300 F
Equipment ID:
Deviation: 11. Other Than Flow

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. No credible causes identified.															

Node: 2. (Liquid Stream) High Pressure Separator (V-101) to Low Pressure Separator (V-102)
Drawings: D-254-002-002; D-254-002-003
Design Conditions/Parameters: MAWP = 75 psig @ 300 F
Equipment ID:
Deviation: 12. Composition

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. No new credible causes identified.															

Node: 3. (Gas Stream) Low Pressure Separator (V-102), Gas Compressor (C-104), and Compressor Discharge Cooler (H-105) (includes gas spillback to Low Pressure Separator)
Drawings: D-254-002-003; D-254-002-005
Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
50 psig @ 70 F (Compressor Suction)
350 psig @ 300 F
(Compressor Discharge)
Equipment ID:
Deviation: 1. More Pressure

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Failure of control loop PIC-104A to gas export header such that valve is too much closed	1. Potential pressure equilibration from M101 High Pressure Separator through 6" header to the gas export pipeline to compressor and spillback line to M-102. Potential overpressurization of C104 discharge piping, rupture of tubes in	4	3	3	1. Relief valve PSV-102 opens to flare. 2. Relief valve PSV-104B opens to	3	4	3	3	0	0	0	0	1. Consider adding a SDV which closes on PT104D HH, in the gas compressor spill back line to the Low Pressure Separator M102. 3. Ensure PSV-102 is adequately sized to vent	

Node: 3. (Gas Stream) Low Pressure Separator (V-102), Gas Compressor (C-104), and Compressor Discharge Cooler (H-105) (includes gas spillback to Low Pressure Separator)

Drawings: D-254-002-003; D-254-002-005

Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
50 psig @ 70 F (Compressor Suction)
350 psig @ 300 F
(Compressor Discharge)

Equipment ID:

Deviation: 1. More Pressure

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
	H105 and overpressure of M102 Low Pressure Separator and associated piping. Design pressure of M102 piping is rated up to 230 PSIG with potential for pressures up to 700 PSIG. Potential loss of mechanical integrity. Potential rupture of Low Pressure Separator resulting in large release of hydrocarbons. Potential fire and explosion.				flare.									all flow from M-101 for this consequence.	
	2. Potential surging and internal damage to the compressor. Commercial issue with asset damage, no hazardous consequences identified. (Gary: What compressor are we dealing with?)	0	0	2	1. FV104 Gas Compressor spillback loop will dissipate excess pressure. 2. Operator response to PT-104A high pressure alarm. 3. High pressure shutdown of C104 gas compressor by PT-104C HH and SDV-104A.	3	0	0	2	0	0	0	0	4. Consider adding a check valve to the gas export pipeline between the spillback pipeline to the LP Separator M-102 and the tie-in for HP Separator M-101 gas outlet. 5. Ensure PSV-104B is adequately sized to vent all flow from M-101 for this consequence. 6. Ensure compressor control room is situated away from the cooler such that the potential release of shrapnel cannot harm personnel.	
	3. Potential pressure equilibration from M101 High Pressure Separator through 6" header to the gas export pipeline. Potential overpressurization of C104 discharge piping, rupture of tubes in Discharge Cooler H105. Design pressure of H105 piping is rated up to 500 PSIG with potential for pressures up to 700 PSIG. Potential loss of mechanical integrity. Potential rupture of Discharge Cooler resulting in release of flammable hydrocarbons. Potential fire and explosion.	4	2	2	1. Relief valve PSV-104B opens to flare. 2. PT-104C high pressure shutdown causes shutoff of C-104. 3. PT-104D high pressure shutdown causes shutoff of C-104. 4. Gas detection will sound alarm. Hazard is assumed to escalate too quickly for alarm to be valid - no IPL credit.	3	4	2	2	0	0	0	0		
2. Failure of control loop FIC-104 (spillback to M102) such that valve is too much closed	1. Potential for gas compressor surging; Potential internal damage to the compressor. Commercial issue with asset damage, no hazardous consequences identified.	0	0	2	1. Operator response to PT-104A high pressure alarm. 2. High pressure shutdown of C104 gas compressor by PT-104C HH and SDV-104A.	3	0	0	2	1	0	0	0		
3. Failure of SDV104B (closed) to gas export header	1. Potential pressure equilibration from M101 High Pressure Separator through 6" header to the gas export pipeline to compressor and spillback line to M-102. Potential overpressurization of C104 discharge piping, rupture of tubes in H105 and overpressure of M102 Low Pressure Separator and associated piping. Design pressure of M102 piping is rated up to 230 PSIG with potential for pressures up to 700 PSIG. Potential loss of mechanical integrity. Potential rupture of Low Pressure Separator resulting in large release of hydrocarbons. Potential fire and explosion.	4	3	3	1. Relief valve PSV-102 opens to flare. 2. Relief valve PSV-104B opens to flare.	3	4	3	3	0	0	0	0	1. Consider adding a SDV which closes on PT104D HH, in the gas compressor spill back line to the Low Pressure Separator M102.	

Node: 3. (Gas Stream) Low Pressure Separator (V-102), Gas Compressor (C-104), and Compressor Discharge Cooler (H-105) (includes gas spillback to Low Pressure Separator)

Drawings: D-254-002-003; D-254-002-005

Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
50 psig @ 70 F (Compressor Suction)
350 psig @ 300 F
(Compressor Discharge)

Equipment ID:

Deviation: 1. More Pressure

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
	2. Potential internal damage to the compressor. Commercial issue with asset damage, no hazardous consequences identified. (Gary: What compressor are we dealing with?)	0	0	2	1. FV104 Gas Compressor spillback loop will dissipate excess pressure. 2. Relief valve PSV-104B opens to flare. 3. High pressure shutdown of C104 gas compressor by PT-104C HH and SDV-104A.	3	0	0	2	0	0	0	0		
	3. Potential pressure equilibration from M101 High Pressure Separator through 6" header to the gas export pipeline. Potential overpressurization of C104 discharge piping, rupture of tubes in Discharge Cooler H105. Design pressure of H105 piping is rated up to 500 PSIG with potential for pressures up to 700 PSIG. Potential loss of mechanical integrity. Potential rupture of Discharge Cooler resulting in release of flammable hydrocarbons. Potential fire and explosion.	4	2	2	1. Relief valve PSV-104B opens to flare. 2. PT-104C high pressure shutdown causes shutoff of C-104. 3. PT-104D high pressure shutdown causes shutoff of C-104. 4. Gas detection will sound alarm. Hazard is assumed to escalate too quickly for alarm to be valid - no IPL credit.	3	4	2	2	0	0	0	0		
4. Inadvertent closure of any manual, control or SIS valve downstream, at the end user.	1. Potential pressure equilibration from M101 High Pressure Separator through 6" header to the gas export pipeline to compressor and spillback line to M-102. Potential overpressurization of C104 discharge piping, rupture of tubes in H105 and overpressure of M102 Low Pressure Separator and associated piping. Design pressure of M102 piping is rated up to 230 PSIG with potential for pressures up to 700 PSIG. Potential loss of mechanical integrity. Potential rupture of Low Pressure Separator resulting in large release of hydrocarbons. Potential fire and explosion.	4	3	3	1. Relief valve PSV-102 opens to flare. 2. Relief valve PSV-104B opens to flare. 3. PT-### high pressure shutdown (on downstream gas export pipeline) will shutoff the wellheads and SDV-101.	3	4	3	3					1. Consider adding a SDV which closes on PT104D HH, in the gas compressor spill back line to the Low Pressure Separator M102.	
	2. Potential internal damage to the compressor. Commercial issue with asset damage, no hazardous consequences identified. (Gary: What compressor are we dealing with?)	0	0	2	1. FV104 Gas Compressor spillback loop will dissipate excess pressure. 2. Relief valve PSV-104B opens to flare. 3. High pressure shutdown of C104 gas compressor by PT-104C HH and SDV-104A. 4. PT-### high pressure shutdown (on downstream gas export pipeline) will shutoff the wellheads and SDV-101.	3	0	0	2						
	3. Potential pressure equilibration from M101 High Pressure Separator through 6" header to the gas export pipeline. Potential overpressurization of C104 discharge piping, rupture of tubes in Discharge Cooler H105. Design	4	2	2	1. Relief valve PSV-104B opens to flare. 2. PT-104C high pressure shutdown causes shutoff of C-104. 3. PT-104D high pressure shutdown causes shutoff of C-104.	3	4	2	2						

Node: 3. (Gas Stream) Low Pressure Separator (V-102), Gas Compressor (C-104), and Compressor Discharge Cooler (H-105) (includes gas spillback to Low Pressure Separator)

Drawings: D-254-002-003; D-254-002-005

Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
50 psig @ 70 F (Compressor Suction)
350 psig @ 300 F
(Compressor Discharge)

Equipment ID:

Deviation: 1. More Pressure

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
	pressure of H105 piping is rated up to 500 PSIG with potential for pressures up to 700 PSIG. Potential loss of mechanical integrity. Potential rupture of Discharge Cooler resulting in release of flammable hydrocarbons. Potential fire and explosion.				4. Gas detection will sound alarm. Hazard is assumed to escalate too quickly for alarm to be valid - no IPL credit.										
5. Tube fouling (Gradual buildup of solids) in H105 Discharge Cooler.	1. Potential for gas compressor surging; Potential internal damage to the compressor. Commercial issue with asset damage, no hazardous consequences identified.	0	0	2	1. Operator response to PT-104A high pressure alarm. 2. High pressure shutdown of C104 gas compressor by PT-104C HH and SDV-104A.	2	0	0	1	0	0	0	0		1. Process runs in clean service which reduces the likelihood of tube fouling occurring.

Node: 3. (Gas Stream) Low Pressure Separator (V-102), Gas Compressor (C-104), and Compressor Discharge Cooler (H-105) (includes gas spillback to Low Pressure Separator)

Drawings: D-254-002-003; D-254-002-005

Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
50 psig @ 70 F (Compressor Suction)
350 psig @ 300 F
(Compressor Discharge)

Equipment ID:

Deviation: 2. Less Pressure

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. SDV 104A fails closed	1. Potential vacuum conditions on C104 Suction; potential compressor damage. Commercial issue with asset damage, no hazardous consequences identified	0	0	1	1. High pressure shutdown PT-102B closes SDV-104A 2. Operator response to PT-102A high pressure alarm.	3	0	0	1	1	0	0	0		
2. Failure of control loop LIC-101 causing LV-101 to fail too closed	1. Potential vacuum conditions on C104 Suction; potential compressor damage. Commercial issue with asset damage, no hazardous consequences identified	0	0	1	1. High pressure shutdown PT-102B closes SDV-104A 2. Operator response to PT-101C high pressure alarm.	3	0	0	1	1	0	0	0		
3. Inadvertent closure of SDV-102A	1. Potential vacuum conditions on C104 Suction; potential compressor damage. Commercial issue with asset damage, no hazardous consequences identified	0	0	1	1. High pressure shutdown PT-102B closes SDV-104A 2. Operator response to PT-102A high pressure alarm.	3	0	0	1	1	0	0	0		

Node: 3. (Gas Stream) Low Pressure Separator (V-102), Gas Compressor (C-104), and Compressor Discharge Cooler (H-105) (includes gas spillback to Low Pressure Separator)

Drawings: D-254-002-003; D-254-002-005

Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
50 psig @ 70 F (Compressor Suction)
350 psig @ 300 F
(Compressor Discharge)

Equipment ID:

Deviation: 3. More Temperature

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. H105 failure causing excess temperature of compressor vapors	1. Potential inaccuracy in DCS flow and temperature indications; potential instrument damage from 350F vapor temperature; potential for excess temperature in cooler tubes. Potential personnel injury if exposed to hot tubing.	1	0	1	1. High temperature shutdown of gas compressor by TT104A. 2. Cooler is insulated for personnel protection.	2	0	0	0	0	0	0	0		

Node: 3. (Gas Stream) Low Pressure Separator (V-102), Gas Compressor (C-104), and Compressor Discharge Cooler (H-105) (includes gas spillback to Low Pressure Separator)

Drawings: D-254-002-003; D-254-002-005

Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
50 psig @ 70 F (Compressor Suction)
350 psig @ 300 F
(Compressor Discharge)

Equipment ID:

Deviation: 4. Less Temperature

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. No credible causes															

Node: 3. (Gas Stream) Low Pressure Separator (V-102), Gas Compressor (C-104), and Compressor Discharge Cooler (H-105) (includes gas spillback to Low Pressure Separator)

Drawings: D-254-002-003; D-254-002-005

Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
50 psig @ 70 F (Compressor Suction)
350 psig @ 300 F
(Compressor Discharge)

Equipment ID:

Deviation: 5. More Level

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. No new credible causes. Introduction of liquids into the compressor system are addressed in Node 2 - More Level.															

Node: 3. (Gas Stream) Low Pressure Separator (V-102), Gas Compressor (C-104), and Compressor Discharge Cooler (H-105) (includes gas spillback to Low Pressure Separator)

Drawings: D-254-002-003; D-254-002-005

Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
50 psig @ 70 F (Compressor Suction)
350 psig @ 300 F
(Compressor Discharge)

Equipment ID:

Deviation: 6. Less Level

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. No credible causes															

Node: 3. (Gas Stream) Low Pressure Separator (V-102), Gas Compressor (C-104), and Compressor Discharge Cooler (H-105) (includes gas spillback to Low Pressure Separator)

Drawings: D-254-002-003; D-254-002-005

Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
50 psig @ 70 F (Compressor Suction)
350 psig @ 300 F
(Compressor Discharge)

Equipment ID:

Deviation: 7. More Flow

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Failure of FIC-104 causing FV-104 to fail too open.	1. Potential accumulation of vapor resulting in overpressure of LP Separator M-102. Potential rupture of vessel resulting in release of hydrocarbons to atmosphere. Potential fire/explosion.	4	3	3	1. PT-102B high pressure shutdown causes C104 shutoff. 2. Operator response to PT-102A high pressure alarm. 3. Relief valve PSV-102 opens to flare. 4. Relief valve PSV-104B opens to flare. No IPL credit - relief valve is not sized for LP separator overpressure.	3	4	3	3	0	0	0	0		

Node: 3. (Gas Stream) Low Pressure Separator (V-102), Gas Compressor (C-104), and Compressor Discharge Cooler (H-105) (includes gas spillback to Low Pressure Separator)

Drawings: D-254-002-003; D-254-002-005

Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
50 psig @ 70 F (Compressor Suction)
350 psig @ 300 F
(Compressor Discharge)

Equipment ID:

Deviation: 8. No/Less Flow

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. No additional causes															

Node: 3. (Gas Stream) Low Pressure Separator (V-102), Gas Compressor (C-104), and Compressor Discharge Cooler (H-105) (includes gas spillback to Low Pressure Separator)

Drawings: D-254-002-003; D-254-002-005

Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
50 psig @ 70 F (Compressor Suction)
350 psig @ 300 F
(Compressor Discharge)

Equipment ID:

Deviation: 9. Misdirected Flow

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Compressor seal leak into lube oil system.	1. Potential degassing in the oil expansion tank resulting in displacement of oil from tank. Potential fire and release of flammable vapors in the vicinity of the oil reservoir.	2	2	2	1. LT-110 low level shutdown causes shutoff of C-104. 2. PT-105B low pressure shutdown causes shutoff of C-104.	3	2	2	2	1	0	0	0	7. Ensure that gas detection heads are located in the vicinity of the oil expansion tank.	

Node: 3. (Gas Stream) Low Pressure Separator (V-102), Gas Compressor (C-104), and Compressor Discharge Cooler (H-105) (includes gas spillback to Low Pressure Separator)

Drawings: D-254-002-003; D-254-002-005

Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
50 psig @ 70 F (Compressor Suction)
350 psig @ 300 F
(Compressor Discharge)

Equipment ID:

Deviation: 10. Reverse Flow

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Compressor shutdown with low supply pressure from M101 or production header (inadvertent closure of production inlet valve or upstream users causing pressure	1. Reverse flow from gas export header through spillback line, or compressor if not blocked in; Potential overpressurization of M102 Low	4	3	3	1. Relief valve PSV-102 opens to flare 2. Relief valve PSV-104A opens to flare	1	2	1	1	0	0	0	0		

Node: 3. (Gas Stream) Low Pressure Separator (V-102), Gas Compressor (C-104), and Compressor Discharge Cooler (H-105) (includes gas spillback to Low Pressure Separator)

Drawings: D-254-002-003; D-254-002-005

Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
50 psig @ 70 F (Compressor Suction)
350 psig @ 300 F
(Compressor Discharge)

Equipment ID:

Deviation: 10. Reverse Flow

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
to drop below 350 psig)	Pressure Separator and associated equipment. Design pressure of M102 is rated up to 75 PSIG with potential for pressures up to 700 PSIG. Potential loss of mechanical integrity. Potential rupture of Low Pressure Separator resulting in large release of hydrocarbons. Potential fire and explosion.				3. PT-102B high pressure shutdown causes C104 shutoff. 4. PT-104D high pressure shutdown causes C104 shutoff. 5. C-105 check valve										

Node: 3. (Gas Stream) Low Pressure Separator (V-102), Gas Compressor (C-104), and Compressor Discharge Cooler (H-105) (includes gas spillback to Low Pressure Separator)

Drawings: D-254-002-003; D-254-002-005

Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
50 psig @ 70 F (Compressor Suction)
350 psig @ 300 F
(Compressor Discharge)

Equipment ID:

Deviation: 11. Composition

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Entrainment of liquid droplets in vapor to compressor suction, due to high M102 level and reduced surface disengagement area.	1. Potential increased level in drain boot, potential liquid carryover to C104, potential compressor damage. Commercial issue with asset damage, no hazardous consequences identified.	0	0	2	1. Operator response to LT-102A high level alarm.	2	0	0	1	1	0	0	0		

Node: 3. (Gas Stream) Low Pressure Separator (V-102), Gas Compressor (C-104), and Compressor Discharge Cooler (H-105) (includes gas spillback to Low Pressure Separator)

Drawings: D-254-002-003; D-254-002-005

Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
50 psig @ 70 F (Compressor Suction)
350 psig @ 300 F
(Compressor Discharge)

Equipment ID:

Deviation: 12. Other Than Flow

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Introduction of process fluid into cooling air (due to cooler tube rupture).	1. Potential for large flammable gas and liquid release to atmosphere. Potential pool fire or jet flame/explosion. Potential significant commercial and environmental impacts.	4	2	2	1. Pad drains to sump area, routing flammable fuel away from process equipment. 2. Gas detection will isolate equipment (closes SDV-101, 104B, 103). 3. The team expects that there will multiple fans installed. This will result in the dilution of flammable gas.	2	3	1	1	0	0	0	0		

Node: 4. (Liquid Stream) Low Pressure Separator (V-102) through Export Pump (P-103) to Export Liquid Pipeline (includes liquid spillback to Low Pressure Separator from Export Pump) Drawings: D-254-002-003; D-254-002-004

Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
2150 psig @ 300 F (Pump Discharge)

Equipment ID:

Deviation: 1. More Pressure

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Failure of control loop FIC-103C such that valve is too much closed	1. Potential deadheading of pump resulting in pump damage due to overheating. Commercial issue with asset damage, no hazardous consequences identified	0	0	1	1. FIC-103A provides spillback to M102 Low Pressure Separator. 2. Operator response to TT103 High Temperature alarm. 3. PT-103C High Pressure shutdown causes P-103 shutoff.	3	0	0	1	0	0	0	0		
2. Failure of control loop FIC-103A such that valve is too much closed when flow is blocked to export header	1. Potential deadheading of pump resulting in pump damage due to overheating. Commercial issue with asset damage, no hazardous consequences identified	0	0	1	1. FIC-103A provides spillback to M102 Low Pressure Separator. No IPL credit - component is part of failed control loop. 2. Operator response to TT103 High Temperature alarm. 3. PT-103C High Pressure shutdown causes P-103 shutoff.	3	0	0	1	0	0	0	0		
3. Thermal expansion in discharge in export pipeline, during extended shutdowns.	1. Potential for overpressure of piping and associated equipment. Potential for loss of mechanical integrity, potential leaks in flanges and fittings. Potential release of flammable material. Potential fire.	3	2	1	1. Relief valve PSV-103 relieves pressure to a safe location	2	2	1	0	0	0	0	0		
4. Manual valves blocked in discharge line.	1. Potential deadheading of pump resulting in pump damage due to overheating. Commercial issue with asset damage, no hazardous consequences identified	0	0	1	1. FIC-103A provides spillback to M102 Low Pressure Separator. 2. Operator response to TT103 High Temperature alarm. 3. PT-103C High Pressure shutdown causes P-103 shutoff.	2	0	0	0	0	0	0	0		
5. Inadvertent closure of SDV-103.	1. Potential deadheading of pump resulting in pump damage due to overheating. Commercial issue with asset damage, no hazardous consequences identified	0	0	1	1. FIC-103A provides spillback to M102 Low Pressure Separator. 2. Operator response to TT103 High Temperature alarm. 3. PT-103C High Pressure shutdown causes P-103 shutoff.	3	0	0	1	0	0	0	0		

Node: 4. (Liquid Stream) Low Pressure Separator (V-102) through Export Pump (P-103) to Export Liquid Pipeline (includes liquid spillback to Low Pressure Separator from Export Pump) Drawings: D-254-002-003; D-254-002-004

Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
2150 psig @ 300 F (Pump Discharge)

Equipment ID:

Deviation: 2. Less Pressure

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Failure of SDV-102B such that valve is too much closed	1. Potential Export Pump cavitation, resulting in pump damage. Commercial issue with asset damage, no hazardous consequences identified.	0	0	1	1. PT-103C Low pressure shutdown of P103. 2. FT-103B Low flow shutdown closes SDV-103. 3. Operator response to low flow alarm on FT-103A.	2	0	0	0	1	0	0	0		
2. Manual valve blocked in pump suction	1. Potential Export Pump cavitation, resulting in pump damage. Commercial issue with asset damage, no	0	0	1	1. PT-103C Low pressure shutdown of P103. 2. FT-103B Low flow shutdown closes SDV-103.	2	0	0	0	1	0	0	0		

Node: 4. (Liquid Stream) Low Pressure Separator (V-102) through Export Pump (P-103) to Export Liquid Pipeline (includes liquid spillback to Low Pressure Separator from Export Pump)

Drawings: D-254-002-003; D-254-002-004

Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
2150 psig @ 300 F (Pump Discharge)

Equipment ID:

Deviation: 2. Less Pressure

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
	hazardous consequences identified.				3. Operator response to low flow alarm on FT-103A.										

Node: 4. (Liquid Stream) Low Pressure Separator (V-102) through Export Pump (P-103) to Export Liquid Pipeline (includes liquid spillback to Low Pressure Separator from Export Pump)

Drawings: D-254-002-003; D-254-002-004

Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
2150 psig @ 300 F (Pump Discharge)

Equipment ID:

Deviation: 3. More Temperature

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. High temperature could indicate an export pump blocked flow condition. This hazard has been addressed in previous deviations.															

Node: 4. (Liquid Stream) Low Pressure Separator (V-102) through Export Pump (P-103) to Export Liquid Pipeline (includes liquid spillback to Low Pressure Separator from Export Pump)

Drawings: D-254-002-003; D-254-002-004

Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
2150 psig @ 300 F (Pump Discharge)

Equipment ID:

Deviation: 4. Less Temperature

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. no credible cause															

Node: 4. (Liquid Stream) Low Pressure Separator (V-102) through Export Pump (P-103) to Export Liquid Pipeline (includes liquid spillback to Low Pressure Separator from Export Pump)

Drawings: D-254-002-003; D-254-002-004

Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
2150 psig @ 300 F (Pump Discharge)

Equipment ID:

Deviation: 5. More Level

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Failure of export pump P103	1. Potential overfill of the Low Pressure Separator M-102. Potential liquid carryover to Export Gas Compressor C104, potential compressor damage. potential fire/explosion, Potential for fire, explosion, environmental impacts, equipment damage and personnel injury. Potential for off-spec product.	4	2	2	1. High level shutdown LT-102B closes compressor isolation valve SDV-102A and SDV-104A. 2. Operator response to high level alarm LT-102B 3. Operator response to low flow alarm FT-103C.	2	3	1	1	0	0	0	0		
2. Inadvertent closure of SDV-103.	1. Potential overfill of the Low Pressure Separator M-102. Potential liquid carryover to Export Gas Compressor	4	2	2	1. High level shutdown LT-102B closes compressor isolation valve SDV-102A and SDV-104A.	2	3	1	1	0	0	0	0		

Node: 4. (Liquid Stream) Low Pressure Separator (V-102) through Export Pump (P-103) to Export Liquid Pipeline (includes liquid spillback to Low Pressure Separator from Export Pump) Drawings: D-254-002-003; D-254-002-004

Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
2150 psig @ 300 F (Pump Discharge)

Equipment ID:

Deviation: 5. More Level

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
	C104, potential compressor damage. potential fire/explosion, Potential for fire, explosion, environmental impacts, equipment damage and personnel injury. Potential for off-spec product.				2. Operator response to high level alarm LT-102B 3. Operator response to low flow alarm FT-103C.										
3. Failiure of control loop FIC-103A causing FV-103A to fail too open.	1. Potential overfill of the Low Pressure Separator M-102. Potential liquid carryover to Export Gas Compressor C104, potential compressor damage. potential fire/explosion, Potential for fire, explosion, environmental impacts, equipment damage and personnel injury. Potential for off-spec product.	4	2	2	1. High level shutdown LT-102B closes compressor isolation valve SDV-102A and SDV-104A. 2. Operator response to high level alarm LT-102B 3. Operator response to low flow alarm FT-103C.	2	3	1	1	0	0	0	0		

Node: 4. (Liquid Stream) Low Pressure Separator (V-102) through Export Pump (P-103) to Export Liquid Pipeline (includes liquid spillback to Low Pressure Separator from Export Pump) Drawings: D-254-002-003; D-254-002-004

Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
2150 psig @ 300 F (Pump Discharge)

Equipment ID:

Deviation: 6. Less Level

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. No new credible causes - loss of flow to export pump P-103 is addressed in deviation Less Pressure.															

Node: 4. (Liquid Stream) Low Pressure Separator (V-102) through Export Pump (P-103) to Export Liquid Pipeline (includes liquid spillback to Low Pressure Separator from Export Pump) Drawings: D-254-002-003; D-254-002-004

Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
2150 psig @ 300 F (Pump Discharge)

Equipment ID:

Deviation: 7. More Flow

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Low pressure in the export pipeline due to a leak or rupture	1. Potential large release of hydrocarbons; potential fire / explosion.	4	3	3	1. Low pressure shutdown PT-103D closes SDV103. 2. Operator response to FT-103C high flow alarm. 3. Operator response to low pressure alarm at downstream end user.	1	2	1	1	0	0	0	0		
2. Low pressure in the export pipeline due to end user usage.	1. Potential for pump to "run out on curve", potential pump damage; Commercial issue with asset damage, no hazardous consequences identified.	0	0	1	1. Low pressure shutdown PT-103D closes SDV103. 2. Operator response to FT-103C high flow alarm. 3. Operator response to low pressure alarm at downstream end user.	2	0	0	0	0	0	0	0		

Node: 4. (Liquid Stream) Low Pressure Separator (V-102) through Export Pump (P-103) to Export Liquid Pipeline (includes liquid spillback to Low Pressure Separator from Export Pump) Drawings: D-254-002-003; D-254-002-004

Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
2150 psig @ 300 F (Pump Discharge)

Equipment ID:

Deviation: 8. No/Less Flow

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. No additional causes															

Node: 4. (Liquid Stream) Low Pressure Separator (V-102) through Export Pump (P-103) to Export Liquid Pipeline (includes liquid spillback to Low Pressure Separator from Export Pump) Drawings: D-254-002-003; D-254-002-004

Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
2150 psig @ 300 F (Pump Discharge)

Equipment ID:

Deviation: 9. Reverse Flow

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Failure of export pump P103	1. Potential reverse flow to Low Pressure Separator M-102 resulting in vessel and associated piping overpressure. Potential rupture of M-102 with release of hydrocarbons to atmosphere. Potential fire/explosion.	4	3	2	1. Low flow shutdown FT-103B closes SDV-103. 2. Operator response to low flow alarm on FT-103A. 3. Check valve C-103 prevents backflow.	2	3	2	1	0	0	0	0		

Node: 4. (Liquid Stream) Low Pressure Separator (V-102) through Export Pump (P-103) to Export Liquid Pipeline (includes liquid spillback to Low Pressure Separator from Export Pump) Drawings: D-254-002-003; D-254-002-004

Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
2150 psig @ 300 F (Pump Discharge)

Equipment ID:

Deviation: 10. Other Than Flow

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. no credible causes															

Node: 4. (Liquid Stream) Low Pressure Separator (V-102) through Export Pump (P-103) to Export Liquid Pipeline (includes liquid spillback to Low Pressure Separator from Export Pump) Drawings: D-254-002-003; D-254-002-004

Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
2150 psig @ 300 F (Pump Discharge)

Equipment ID:

Deviation: 11. Misdirected Flow

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Inadvertent opening of pump suction bleed valve.	1. Potential loss of suction to export pump and release of flammable liquids to containment basin and sump. Potential pool fire.	3	1	1	1. Gas detection will sound alarm. 2. Liquid containment system around pump (including sump). 3. Operating procedures on pump prior to startup.	3	3	1	1	0	0	0	0		

Node: 4. (Liquid Stream) Low Pressure Separator (V-102) through Export Pump (P-103) to Export Liquid Pipeline (includes liquid spillback to Low Pressure Separator from Export Pump) Drawings: D-254-002-003; D-254-002-004

Design Conditions/Parameters: MAWP = 75 psig @ 300 F (LP Separator)
2150 psig @ 300 F (Pump Discharge)

Equipment ID:

Deviation: 12. Composition

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Poor separation of gas from condensate leading to foam, or net positive suction head (NPSH) too low.	1. Potential Export Pump cavitation, resulting in pump damage. Commercial issue with asset damage, no hazardous consequences identified.	0	0	1	1. PT-103C Low pressure shutdown of P103. 2. Operator response to FT-103B low flow alarm.	2	0	0	0	0	0	0	0		

Node: 5. Global Considerations

Drawings:

Design Conditions/Parameters:

Equipment ID:

Deviation: 1. Facility Siting

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Control room located within close proximity of process components with hazardous release of process material/shrapnel near control room.	1. Potential injury/fatality to personnel in control room if hazardous process material/shrapnel are released. Potential fire/explosion during a flammable process material release.	5	2	3	1. Fire and gas detection systems will detect hazardous concentrations of flammable material and alert personnel to a hazard condition. 2. High pressure shutdown in production (in the vicinity of the control room) prevents occurrence of piping/equipment rupture.	2	4	1	2	1	3	0	1	8. Consider the installation of a blast wall between the control room/MCC and relevant process equipment to prevent personnel exposure to a release of hazardous material/shrapnel. If installation of a blast wall is not deemed feasible, consider re-design of facility to move the control room away from any potential hazards associated with a release of hazardous material/shrapnel.	
2. Heavy equipment (i.e. HVAC unit) situated on roof of facility during process material explosion.	1. Potential loss of building integrity and personnel injury/fatality due to falling equipment.	5	1	3	1. Fire and gas detection systems will detect hazardous concentrations of flammable material and alert personnel to a hazard condition. 2. High pressure shutdown in production prevents occurrence of piping/equipment rupture.	1	3	0	1	1	3	0	1	8. Consider the installation of a blast wall between the control room/MCC and relevant process equipment to prevent personnel exposure to a release of hazardous material/shrapnel. If installation of a blast wall is not deemed feasible, consider re-design of facility to move the control room away from any potential hazards associated with a release of hazardous material/shrapnel. 9. Consider roof loading to a minimum to reduce the likelihood of this cause occurring.	
3. Glass windows and/or egress doors in the vicinity of production during process material explosion.	1. Potential for personnel injury/fatality due to propelled glass/debris during explosion.	4	1	2	1. Fire and gas detection systems will detect hazardous concentrations of flammable material and alert personnel to a hazard condition. 2. High pressure shutdown in production prevents occurrence of piping/equipment rupture.	1	2	0	0	1	2	0	0	8. Consider the installation of a blast wall between the control room/MCC and relevant process equipment to prevent personnel exposure to a release of hazardous material/shrapnel. If installation of a blast wall is not deemed feasible, consider re-design of facility to move the control room away from any potential hazards associated with a release of hazardous material/shrapnel. 10. Consider the installation of explosion-resistant windows and doors to reduce the likelihood of the initiating cause.	
4. Vehicle parked/operating in the vicinity of high gas producers during release of hazardous process material.	1. Potential introduction of combustible ignition source to process. Potential fire/explosion in the vicinity of exposed vehicles.	4	1	2	1. High pressure shutdown in production prevents occurrence of piping/equipment rupture. 2. Fire and gas detection systems will detect hazardous concentrations of flammable material and alert personnel to a hazard condition.	2	3	0	1	0	0	0	0	11. Ensure roadways and parking lots for vehicles are designed such that vehicles are not exposed to areas where hazardous material may be released. 12. Ensure vehicles operating near hazardous areas have proper electrical classification.	

Node: 5. Global Considerations
Design Conditions/Parameters:
Equipment ID:
Deviation: 1. Facility Siting

Drawings:

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
					3. Operators equipped with explosion-proof two-way radios for communication to control room.										

Node: 5. Global Considerations
Design Conditions/Parameters:
Equipment ID:
Deviation: 2. Electricity

Drawings:

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Loss of central electrical power supply.	1. Shutdown of facility and subsequent loss of production. Commercial hazard; no safety hazards identified.	0	0	2	1. No safeguards identified.	3	0	0	2	3	0	0	2	13. Determine from end user the maximum allowable time for the process to be shutdown. Concern is associated losses due to shutdown of the facility.	
	2. Potential to inadvertently flare process vapor through blowdown valves (fail-open) to flare system. Potential release of hydrocarbons through flare stack and subsequent fire/explosion. No safety consequences identified (release situated away from process).	0	2	3	1. No safeguards identified.	3	0	2	3	3	0	2	3	14. Ensure blowdown valves are configured to fail-open at a set pressure such that valves will not open during a process shutdown due to loss of electrical power.	
2. Loss of one or more power substations.	1. Partial shutdown of facility with production losses. Commercial hazard; no safety hazards identified.	0	0	2	1. Multiple high or low pressure and flow shutdowns on subject vessels isolates vessels and shuts off production system.	3	0	0	2	0	0	0	0	15. Ensure that SIF necessary to prevent this hazard meet the required levels of risk reduction for this initiating cause.	
	2. Potential to overpressure low-pressure vessels while process is still in operation. Potential hydrocarbon release to atmosphere. Potential fire/explosion.	4	3	3	1. Multiple high or low pressure and flow shutdowns on subject vessels isolates vessels and shuts off production system.	3	4	3	3	0	0	0	0		

Node: 5. Global Considerations
Design Conditions/Parameters:
Equipment ID:
Deviation: 3. Instrument Air Supply (IAS)

Drawings:

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Loss of central instrument air supply.	1. Shutdown of facility and subsequent loss of production. Commercial hazard; no safety hazards identified.	0	0	2	1. No safeguards identified.	3	0	0	2	3	0	0	2	13. Determine from end user the maximum allowable time for the process to be shutdown. Concern is associated losses due to shutdown of the facility.	
	2. Potential to inadvertently flare process vapor through blowdown valves (fail-open) to flare system. Potential release of hydrocarbons through flare stack and subsequent fire/explosion. No safety consequences identified (release situated away from process).	0	2	3	1. No safeguards identified.	3	0	2	3	3	0	2	3	14. Ensure blowdown valves are configured to fail-open at a set pressure such that valves will not open during a process shutdown due to loss of electrical power.	
2. Supply pipeline failure resulting in loss of instrument air to one or more process units.	1. Partial shutdown of facility with production losses. Commercial hazard; no safety hazards identified.	0	0	2	1. Multiple high or low pressure and flow shutdowns on subject vessels isolates vessels and shuts off production system.	3	0	0	2	0	0	0	0	15. Ensure that SIF necessary to prevent this hazard meet the required levels of risk reduction for this initiating cause.	
	2. Potential to overpressure low-pressure vessels while process is still in	4	3	3	1. Multiple high or low pressure and flow shutdowns on subject vessels	3	4	3	3	0	0	0	0		

Node: 5. Global Considerations
Design Conditions/Parameters:
Equipment ID:
Deviation: 3. Instrument Air Supply (IAS)

Drawings:

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
	operation. Potential hydrocarbon release to atmosphere. Potential fire/explosion.				isolates vessels and shuts off production system.										

Node: 5. Global Considerations
Design Conditions/Parameters:
Equipment ID:
Deviation: 4. DCS

Drawings:

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. HVAC failure resulting in excess ambient temperature.	1. Potential for inaccurate readings in DCS. Potential loss of containment with release of flammable material to environment. Potential fire/explosion.	4	3	3	1. Relief valves will relieve excess temperature from process. 2. High pressure and temperature shutdowns in the process will shutdown the production facility.	3	4	3	3	0	0	0	0	16. Consider adding a high temperature alarm for the HVAC system to prevent excess temperature.	

Node: 5. Global Considerations
Design Conditions/Parameters:
Equipment ID:
Deviation: 5. Flare System

Drawings:

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Accumulation of entrained liquid droplets in the flare system from LP Separator M-102.	1. Potential to release liquid hydrocarbons through the flare stack. Potential for formation of pool fire. Potential fire and local environmental damage in the presence of forest/grasslands.	0	4	1	1. Flare drum sized for entrained liquid hydrocarbons from the LP Separator M-102. 2. Operator expected to drain flare drum on a daily basis.	2	0	3	0	0	0	0	0	17. Ensure that operations are instructed to shutdown the facility in an orderly manner on detected shutdown of flare. 18. Determine the appropriate alarm to be used to detect a loss of the flare.	

Node: 5. Global Considerations
Design Conditions/Parameters:
Equipment ID:
Deviation: 6. Maintenance

Drawings:

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. No new causes identified.															

Node: 5. Global Considerations
Design Conditions/Parameters:
Equipment ID:
Deviation: 7. Fire & Gas

Drawings:

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Loss of facility fire detection during a fire.	1. Potential for loss of containment and escalation of fire. Potential for personnel injury/fatality and development of BLEVE.	4	4	3	1. Limited process inventory of liquids. 2. Containment routed to sump. 3. Insulation of equipment delaying	1	2	2	1	0	0	0	0		

Node: 5. Global Considerations
Design Conditions/Parameters:
Equipment ID:
Deviation: 7. Fire & Gas

Drawings:

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
					propagation of fire.										
2. Loss of facility gas detection during gas leak.	1. Potential for loss of containment and undesired release of toxic gas cloud. Potential for significant explosion in the presence of an ignition source. Potential personnel injury/fatality if exposed to toxic gas.	5	3	3	1. Operating rounds and checklists.	1	3	1	1	0	0	0	0	19. Consider the addition of a low flow differential alarm in downstream export pipelines to detect significant loss of flow between the HP separator inlet pipeline and the export pipelines.	

Node: 5. Global Considerations
Design Conditions/Parameters:
Equipment ID:
Deviation: 8. Administrative Concerns

Drawings:

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. No new causes identified.															

Node: 5. Global Considerations
Design Conditions/Parameters:
Equipment ID:
Deviation: 9. Operating Procedures

Drawings:

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. No new causes identified - Human Factors issues discussed in this node. See Recommendations.														20. Ensure clear facility pathways to instrumentation for operators such that operators can shutoff required devices in adequate time. 21. Ensure clear labeling of MCC and shutdown equipment.	

Node: 5. Global Considerations
Design Conditions/Parameters:
Equipment ID:
Deviation: 10. Safety Equipment (Fire Extinguishers, Wash Stations, etc.)

Drawings:

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. No new causes identified - Human Factors issues discussed in this node. See Recommendations.														22. Review quantity and placement of current safety equipment and locations to ensure that personnel can adequately address safety hazards.	

Node: 5. Global Considerations
Design Conditions/Parameters:
Equipment ID:
Deviation: 11. Startup

Drawings:

Causes	Consequences	S-S	S-E	S-C	Safeguards	Caus	Unmitigated Risk Rankings	Mitigated	Mitigated Risk Rankings	Recommendations	Remarks

						e Likelihood	Safety	Environment	Asset	Likelihood	Safety	Environment	Asset		
1. Introduction of ambient air into HP Separator or LP Separator during maintenance.	1. Potential introduction of ignition source (liquid impingement on baffle creates aerosol mist with formation of static electricity) into separation with accumulation of slugs. Potential hydrocarbon release to atmosphere. Potential fire/explosion.	4	3	3	1. Startup procedures will introduce nitrogen into separator to displace air during startup. 2. Air will be introduced slowly into the vessel such that likelihood of ignition will be low. 3. Monitoring of procedures by an independent operator.	2	3	2	2	0	0	0	0		

Node: 5. Global Considerations
Design Conditions/Parameters:
Equipment ID:
Deviation: 12. Shutdown

Drawings:

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Leak through production header valve SDV-101 during extended shutdown.	1. Potential to overpressure LP Separator M-102. Potential hydrocarbon release to atmosphere. Potential fire/explosion.	3	3	2	1. Limited process inventory.	2	2	2	1	1	1	1	0	23. Ensure installation of a double-block-and-bleed valve arrangement at the battery limits of the facility.	

Node: 5. Global Considerations
Design Conditions/Parameters:
Equipment ID:
Deviation: 13. Environmental Issues

Drawings:

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. Weather issues (hurricane, earthquake, thunderstorms, tornado, etc.) causing equipment damage.	1. Potential loss of containment and release of hydrocarbons to environment. Potential fire/explosion.	4	3	2	1. No safeguards identified.	1	2	1	0	1	2	1	0	23. Ensure installation of a double-block-and-bleed valve arrangement at the battery limits of the facility. 24. Ensure emergency response is available for this scenario.	

Node: 5. Global Considerations
Design Conditions/Parameters:
Equipment ID:
Deviation: 14. Human Factors

Drawings:

Causes	Consequences	S-S	S-E	S-C	Safeguards	Cause Likelihood	Unmitigated Risk Rankings			Mitigated Likelihood	Mitigated Risk Rankings			Recommendations	Remarks
							Safety	Environment	Asset		Safety	Environment	Asset		
1. No new causes identified.															