

VENT STACK LOCATION	VENT	VENT HEIGHT (m)	DESCRIPTION	CASE	CLASSIFICATION	FREQUENCY	DURATION	INLET PRESSURE BAR(A)	INLET TEMP. °C	OUTLET PRESSURE BAR(A)	FLUID COMPOSITION	EMISSION RATES Kg/hr	VENT EXIT TEMPERATURE °C	VENT SIZE	PEAK OR AVERAGE	
Pipelines AGI SJ4455775024	Relief cases for fire at pig launcher	5	Emergency Pressure Relief (fire)	PSV-0002_1	OTNOC - emergency	External Fire case at minimum operating condition of 0 deg.C	Less than one hour expected. Pool fires very unlikely within the local area as no liquid hydrocarbons. In emergency case, safety system shall be activated to stop flow.	61.5 ⁽¹⁾	193.4 ⁽¹⁾	1.0133	As per CO2 Dehydration system outlet parameter % Carbon Dioxide [mol%] : 99.2 - Hydrogen [mol%] : 0.05 - H2O [ppm Mol] : 50 - Methanol [mol%] : 0.07 - Ammonia [mol%] : 8.65E-06	4924	167.1	6"	Peak (min opp temp)	Inlet temp. is at PSV relief pressure (Set pressure X 1.21) during fire case at 61.5 bara. Relief load is calculated with minimum operating temperature at 0 deg.C and normal operating condition of 45 deg.C.
			Emergency Pressure Relief (fire)	PSV-0002_1	OTNOC - emergency	External Fire case at normal operating condition of 45 deg.C	Less than one hour expected. Pool fires very unlikely within the local area as no liquid hydrocarbons. In emergency case, safety system shall be activated to stop flow.	61.5 ⁽¹⁾	270.27 ⁽¹⁾	1.0133		3163	252.5	6"	Peak (normal opp temp)	Minimum operating temperature case is higher rate and colder vent exit temperature and hence will be worst case - modelling of normal operating temperature is therefore unnecessary
	Relief cases for fire at pig receiver	5	Emergency Pressure Relief (fire)	PSV-0025_1	OTNOC - emergency	External Fire case at minimum operating condition of 0 deg.C	Less than one hour expected. Pool fires very unlikely within the local area as no liquid hydrocarbons. In emergency case, safety system shall be activated to stop flow.	61.5 ⁽¹⁾	193.4 ⁽¹⁾	1.0133		1001.8	167.1	3"	Peak (min opp temp)	Inlet temp. is at PSV relief pressure (Set pressure X 1.21) during fire case at 61.5 bara. Relief load is calculated with minimum operating temperature at 0 deg.C and normal operating condition of 45 deg.C.
			Emergency Pressure Relief (fire)	PSV-0025_1	OTNOC - emergency	External Fire case at normal operating condition of 45 deg.C	Less than one hour expected. Pool fires very unlikely within the local area as no liquid hydrocarbons. In emergency case, safety system shall be activated to stop flow.	61.5 ⁽¹⁾	270.27 ⁽¹⁾	1.0133		643.6	252.5	3"	Peak (normal opp temp)	Minimum operating temperature case is higher rate and colder vent exit temperature and hence will be worst case - modelling of normal operating temperature is therefore unnecessary
	Blowdown BDV0010	5	Case 1 - Automatic Blowdown (Fire)	BDV-0010_1	OTNOC - emergency	when require to evacuate system	15 min as per blow down code requirements; fully depressure (maximum pressure to atm)	51 ⁽⁶⁾	136.6 ⁽⁶⁾	1.0133		10958.4	106.6	8"	Peak	Relieving condition is considered with set pressure as inlet condition with corresponding temperature with constant density within system as source will be isolated during fire. Blowdown valve will be utilized to evacuate system after reaching maximum operating/design pressure as from 51 bar to 1.0 bar within 15 min.
			Case 2 - Automatic Blowdown (Ambient)	BDV-0010_2	OTNOC - emergency	when require to evacuate system	Below 15 min.; depressurisation normal operating pressure to 7barg	36.5 ⁽²⁾	45 ⁽²⁾	1.0133		13651.2	5.89		Peak	Blowdown valve will be utilized to evacuate system during normal operating condition to evacuate pressure from operating pressure 36.5 barg to 7.0 barg.
	CO2 metering package 10-AAH-U-001	5	Venting to isolate instrumentation for maintenance	10-AAH-U-001_1	OTNOC - start-up shutdown maintenance	once every year	Less than 15mins as small volumes involved	36.5 ⁽²⁾	45 ⁽²⁾	1.0133		126	5.89	1"	Peak	Normal operating conditions are considered.
	Blowdown BDV-0001	47	Case 1 - Automatic Blowdown (Fire)	BDV-0001_1	OTNOC - emergency	when require	15 min as per blow down code requirements; fully depressure (maximum pressure to atm)	51 ⁽⁶⁾	136.6 ⁽⁶⁾	1.0133		52800	106.6	18"	Peak	Relieving condition is considered with set pressure as inlet condition with corresponding temperature with constant density within system as source will be isolated during fire. Blowdown valve will be utilized to evacuate system after reaching maximum operating/design pressure as from 51 bar to 1.0 bar within 15 min.
			Case 2 - Automatic Blowdown (Ambient)	BDV-0001_2	OTNOC - emergency	when require	Below 15 min.; depressurisation normal operating pressure to 7barg	36.5 ⁽²⁾	45 ⁽²⁾	1.0133		44200	5.89		Peak	Normal operating conditions are considered
	CO2 Dehydration SJ 4456875338	TEG Regeneration Skid 10-FAB-U-102	13	Case 1 - Normal Continuous Off-gas Vent (downstream of still condenser)	10-FAB-U-102_1	operational	continuous	Continuous envisaged due to the type of technology deployed.					As per schedule 5 response 8a: % Carbon Dioxide [kg/h] : 94 - Hydrogen [kg/h] : 0.0016 - H2O [kg/h] : 2.7 - Methanol [kg/h] : 1.4	98	24	2"
Case 2 - Emergency Pressure Relief (fire)				10-FAB-U-102_2	OTNOC - emergency	when require	Less than one hour expected. Pool fires very unlikely within the local area as no liquid hydrocarbons. In emergency case, safety system shall be activated to stop flow.	61.5 ⁽¹⁾	193.4 ⁽¹⁾	1.0133	3499.2	171.3	6"	Peak	Inlet temp. is at PSV relief pressure (Set pressure X 1.21) during fire case at 61.5 bara. This case is considered as worst case from package. Alternate technology without CO2 venting needs to be considered during detail engineering	
CO2 Capture Unit SJ 4453875314	CO2 Absorber Column Reflux Drum V-117 (via PCV-0014)	40	Case 1 - Abnormal Operation -balancing and start-up	CCU_1	OTNOC - start-up	start-up	Full startup from cold anticipated to be in the region of a few days dependant on how quickly stable operation can be achieved (Based on feedback on licensors). Review of start up procedure will be carried out in order to identify opportunities to minimise this time.	1.78 ⁽⁶⁾	35 ⁽⁶⁾	1.0133	Note-6 % Carbon Dioxide (CO2) [mol%] : 96.6221 - Carbon Monoxide (CO) [mol%] : 0.000296 - Nitrogen (N2) [mol%] : 0.000347 - Hydrogen (H2) [mol%] : 0.0513 - Methane (CH4) [mol%] : 0.00021 - H2O [mol%] : 3.313 - Methanol [mol%] : 0.197 - Ammonia [mol%] : 0.0000091 - Active Solvent [mol%] : 8.26E-11	72360	32.39	18"	Peak	Normal operating conditions are considered Note: in reality initial vent will be less concentrated CO2 and flow will not be as high.
			Case 2 - Emergency Pressure Relief (fire)	CCU_2	OTNOC - emergency	when require	Less than one hour expected. Pool fires very unlikely within the local area as no liquid hydrocarbons. In emergency case, safety system shall be activated to stop flow.	10 ⁽⁸⁾	69.2 ⁽⁸⁾	1.0133	17938.8	61.09	12"	Peak	Relieving pressure as set pressure and temperature corresponding at relieving pressure for exit	
		Case 3 - Safety - Tube Rupture of E-106	CCU_3	OTNOC - emergency	when require - very low likelihood	Less than one hour expected. In emergency case, safety system shall be activated to stop flow.	10.1 ⁽⁹⁾	210 ⁽⁹⁾	1.0133	E-106 SHELL Side composition (As per H&MB Stream # 2216) ⁽¹⁰⁾ % Carbon Dioxide (CO2) [mol%] : 0.9 to 5 - Carbon Monoxide (CO) [mol%] : Nil - Nitrogen (N2) [mol%] : Nil - Hydrogen (H2) [mol%] : Nil - Methane (CH4) [mol%] : Nil - H2O [mol%] : 94 to 98 - Methanol [mol%] : 0.4 to 0.82 - Ammonia [mol%] : 0.19 - Active Solvent [mol%] : 0.1 E-106 Tube Side composition (As per H&MB Stream # 2217V) % Carbon Dioxide (CO2) [mol%] : 16.2 - Carbon Monoxide (CO) [mol%] : 0.3 - Nitrogen (N2) [mol%] : 0.1 to 0.9 - Hydrogen (H2) [mol%] : 48.6 - Methane (CH4) [mol%] : 0.18 - H2O [mol%] : 34.5 - Methanol [mol%] : 0.04 to 0.07 - Ammonia [mol%] : 0.01 - Active Solvent [mol%] : 0	7610.4	206.2	8"	Peak	Worst Condition - E-106 Relieving at set pressure and design temperature condition.	
		Case 4 - Nitrogen Purge	CCU_4	OTNOC - start-up shutdown maintenance	N/A - nitrogen only	N/A - nitrogen only	4.5 Op press for purge	18 (As LP N2 Line)	1.0133	Note-7	1584	17.04		Peak	No CO2 venting, pure N2 purge - no requirement for modelling	

			Case 5 - Abnormal Operation (Turndown Case) - balancing and start-up	CCU_5	OTNOC - balancing & start-up	once every 6months	expected to be able to balance within a few hours	1.78 ⁽⁶⁾	35 ⁽⁶⁾	1.0133	Note-6 - Carbon Dioxide (CO ₂) [mol%] : 96.6221 - Carbon Monoxide (CO) [mol%] : 0.000296 - Nitrogen (N ₂) [mol%] : 0.000347 - Hydrogen (H ₂) [mol%] : 0.0513 - Methane (CH ₄) [mol%] : 0.00021 - H ₂ O [mol%] : 3.313 - Methanol [mol%] : 0.197 - Ammonia [mol%] : 0.0000091 - Active Solvent [mol%] : 8.26E-11	29998.8	32.14	12"	Peak	Normal operating conditions are considered
Co2 Compressor Package (C-103)	40	Emergency Pressure Relief	Blocked Outlet- Package	OTNOC - emergency	when require	Less than one hour expected. Safety system in place to shutdown compressor in this event.	55	45.0000	1.0133	- Carbon Dioxide (CO ₂) [mol%] : 96.54 - Carbon Monoxide (CO) [mol%] : 0.000296 - Nitrogen (N ₂) [mol%] : 0.000 - Hydrogen (H ₂) [mol%] : 0.005 - Methane (CH ₄) [mol%] : 0.00 - H ₂ O [mol%] : 3.313 - Methanol [mol%] : 0.11	75473	-14.88	20"	Peak	Maximum relief flow from compressor package with blocked outlet condition. Inlet temperature and pressure is considered based final set pressure (50 barg +10% excess) and relief at normal operating temperature.	
		Emergency Pressure Relief	Fire Case- All in stages relief	OTNOC - emergency	when require	Less than one hour expected. Pool fires very unlikely within the local area as no liquid hydrocarbons. In emergency case, safety system shall be activated to stop flow.	60.5 /13.92	74.24/165.3	1.0133	- Carbon Dioxide (CO ₂) [mol%] : 96.54 - Carbon Monoxide (CO) [mol%] : 0.000296 - Nitrogen (N ₂) [mol%] : 0.000 - Hydrogen (H ₂) [mol%] : 0.005 - Methane (CH ₄) [mol%] : 0.00 - H ₂ O [mol%] : 3.313 - Methanol [mol%] : 0.11	5241	14.61/158.5	20"	Peak	Total relief rate including 4 inter stage PSV relief during emergency fire case. Method- All interstage relief pressure with 21% excess on decided set pressure with pre-assumption of conventional PSV at each interstages KODs.	

Note :

1. Relieving Temperature is considered at maximum relief pressure condition which is 21% excess of set pressure (51 bara)
2. Normal operating pressure and temperature condition
3. Blowdown condition arrived at minimum ambient temperature (-15 °C) and it's coincident pressure with constant density or volume.
4. Pressure as per process design/set pressure and corresponding temperature reached for depressurisation up to 6.9 barg or to further 1.013 barg.
5. deleted
6. Fluid composition and pressure - temperature conditions are based on JM H&MB (5194812-200-49EB-4-0001 Rev 05) stream # 2206.
7. It is assumed that, Fluid composition during Nitrogen Purge case shall contain 100 % N₂ gas.
8. Pressure are based on design conditions specified in CO₂ Removal Unit datasheet and corresponding relieving temp. at 1 vapor fraction considered.
9. Pressure value as per E-106 rupture disk set pressure, however temperature is based on E-106 Shell side design condition.
10. Pressure - temperature conditions are based on JM H&MB (5194812-200-49EB-4-0001 Rev 05) stream # 2216.