Pressure / Vacuum Vent Specification Sheet

					<u> </u>	
	1	TAG NO.		28PSV-5		
	2	SERIAL NUMBER		TC85954		
	3	SERVICE		Treater Feed Surge Drum (V-1)		
	4	LINE NUMBER		Iso 2		
	5	PID#		G-22016		
RAL	6	MANUFACTURER		Consolidated		
GENERAL	7	MODEL NUMBER		1906-30LC-1-CC-MS-31-RF-L		
	8	INERT GAS BLANKET	TARGET PRESSURE			
	9	PRESSURE / VACUUM / BOTH				
	10					
	11					
	12	SIZE: INLET x OUTLET		3" x 4"		
CONN	13	FLANGE RATING: INLET x OUTLET OR S	CREWED	ANSI 300 RF x ANSI 150 RF		
	14					
	15	BODY				
MATERIAL	16	SEAT AND TRIM				
MAT	17	DISK / DIAPHRAGM				
	18					
	19	HOOD				
	20	BUG SCREEN				
SN	21	PALLET GUIDE				
OPTIONS	22	VACCUUM GUIDE				
	23	SEAT RINGS				
	24	DRYER CONNECTION				
	25	FLAME ARRESTOR				
	26	STEAM JACKET				
	27	TANK VOLUME				
	28	OVERPRESSURE SCENARIO SET PRESSURE	RELIEF RATE OVERPRESSURE	1.5 "H2O(g)		
	30	CONSTANT BACKPRESSURE	OVERPRESSURE			
	31	ACTUAL AREA		0.0 "H2O(g) in ²		
BASIS	32	CODE		III-		
-	33	UNDERPRESSURE SCENARIO	RELIEF RATE	API 620		
	34	SET VACUUM	OVERVACUUM	psi		
	35	ACTUAL AREA		in ²		
	36	CODE				
	37	SIZING WITH FLAME ARRESTOR				
	38	REVISION NO. 0	REVISION NOTES			
REVISION	39	REVISION BY KKN				
RE	40	REVISION DATE 07/16/200	1			
		•				

Pressure Relief/Safety Valve Specification Sheet

	_						M
	1	TAG NO.		28PSV-5			
	2	SERIAL NUMBER		TC85954			
1	3	SERVICE					
G				Treater Feed Surge Drum (V-1)			
E N	4	LINE NUMBER		Iso 2			-
E	5	PID#		G-22016			
R	6	SAFETY OR RELIEF		Safety			
L	7	CONVENTIONAL / BELLOWS / PILOT OPERATE	ED	Balanced Bellows			
	8	FULL NOZZLE / SEMI NOZZLE					
	9	BONNET TYPE					
	10	% BLOWDOWN		01. 41.			
C	11	SIZE: INLET X OUTLET		3" x 4"			
N	12	FLANGE RATING: INLET X OUTLET OR SCR	EWED	ANSI 300 RF x ANSI 150 RF			
N	13						
M A	14	BODY		Carbon Steel			
т	15	SEAT AND DISC		316 Stainless Steel			
E R	16	RESILIENT SEAT SEAL		316 Stainless Steel			
	17	GUIDE AND RINGS		316 Stainless Steel			
A L	18	SPRING		Allov Steel			
s	19	BELLOWS					
	20						
0	21	CAP: SCREWED / BOLTED					
P T	22	LEVER: PLAIN / PACKED					
	23	TEST GAG					
O N	24	VENT WITH BUG SCREEN					
s	25						
В	26	CODE		ASME VIII			
A S	27	STAMP		UV			
ı s	28	OVERPRESSURE SCENARIO		External fire			
	29						
	30	FLUID		Stream 6			
	31	FLUID STATE		Vapor			
	32	REQUIRED CAPACITY		59,331.5 lb/hr			
	33	MOLECULAR WEIGHT	SPECIFIC GRAVITY	54.05			
	34	OPERATING PRESSURE	SET PRESSURE / CDTP	65.0 psig	155.0 psig	/ 151.0 psi	
F	35	OPERATING TEMPERATURE	RELIEF TEMPERATURE	90.0 °F	183.5 °F		
U	36	DISCHARGE TO		T-3 Acid Neutralizer			
I D	37	CONSTANT BACK PRESSURE	Kp FACTOR	2.0 psig		N/A	
D	38	DEVELOPED BACK PRESSURE		31.0 psig			
A	39	TOTAL BACK PRESSURE		33.0 psig			
T A	40	% ALLOWABLE OVERPRESSURE		21.0 %			
	41	COMPRESSIBILITY FACTOR		0.77			
	42	COLD DIFFERENTIAL TEST PRESSURE		151.00 psi			
	43	RATIO OF SPECIFIC HEATS		1.27			
	44	RELIEF VISCOSITY		0.010 cP			
	45						
	46	CALCULATED AREA		2.704 in ²			
A	47	SELECTED AREA		2.853 in ²			
R	48	ORIFICE DESIGNATION		L			
A	49	MANUFACTURER		Consolidated			
	50	MODEL NUMBER		1906-30LC-1-CC-MS-31-RF-L			
R	51	REVISION NO.	REVISION NOTES				
E V	52	REVISION BY KKN					
	53	REVISION DATE 07/16/2001					
			IECC INICODMATION			DEC ATE 00000E	

PSV List



Unit 433 HF Alkylation Unit Sun Marketing and Refining Company

	Tag No.	PID No.	Location	Manufacturer	Model No.	Valve Type	Size	Orifice	Set P
1	28PSV-5	G-22016	Treater Feed Surge Drum (V-1)	Consolidated	1906-30LC-1-CC- MS-31-RF-L	Balanced Bellows	3" X 4"	2.853 in ²	155.0 psig

7/8/2019 1 of 1



Pressure Safety Valve

Sun Marketing and Refining Company Philadelphia - Girard Point 433 HF Alkylation

28PSV-5

Treater Feed Surge Drum (V-1)

P&ID No. **G-22016**

ISO No. Iso 2

	-						
	Relief Dev	ice Information					
Manufacturer	Consolidated	Opening Pressure	155.0	psig			
Model Number	1906-30LC-1-CC-MS-31-RF-L	Constant Back Pressure	2.0	psig			
Device Number	TC85954	Cold Differential Set P	151.0	psi			
Size	3" x 4"	Operating Pressure	65.0	psig			
Flange Rating	ANSI 300 RF x ANSI 150 RF	Operating Temperature	90.0	°F			
Safety / Relief	Safety	Code	ASME VIII				
Туре	Balanced Bellows	Stamp	UV				
Orifice API Letter	L	Blowdown		%			
Orifice Size	2.853 in ²	Rupture Disk on Inlet	N	lo			
		Discharge to	T-3 Acid Neu	ıtralizer			
Mater	ials of Construction	,	Accessories				
Body/Bonnet	Carbon Steel	Nozzle					
Seal/Disk	316 Stainless Steel	Сар					
Guide/Rings	316 Stainless Steel	Bonnet					
Spring	Alloy Steel	Lever					
Bellows		Gag					
Resilient Seat Surface	316 Stainless Steel	Vent w/ Bug Screen					
	Protecte	ed Equipment					
Tag Number	Description		P&ID				
V-0001	Treater Feed Surge Drum		G-22016				
	Co	mments					
SO-4136 provides adequa	ate relief capacity for all identified overpre	essure scenarios.					
1	,						
			Revision No.	0			
			KKN	07/16/2001			

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Page 1 of



Pressure Safety Valve

Sun Marketing and Refining Company Philadelphia - Girard Point 433 HF Alkylation

28PSV-5

Treater Feed Surge Drum (V-1)

P&ID No. G-22016

ISO No. Iso 2

Design Basis							
Scenario: External fire (1), on V-0001 59,332 lb/hr							
Sizing Method: API 520 Vapor Sizing			Pressure drop based	on actual capacity			
Required Relief Rate 59,332	lb/hr	Fluid Relieved	Stream 6				
Device Capacity 62,592	lb/hr	Fluid Phase	Vapor				
Required Area 2.704	in²	Relief Pressure	187.6	psig			
Device Actual Area 2.853	in²	% Overpressure	21	%			
Inlet PDrop 4.4 psi (2.8	% of Set)	Relief Temperature	183.5	°F			
Outlet PDrop 31.0 psi (20.0	% of Set)	Mass % Vapor	100.00	%			
Inlet Flow Velocity 168.27	ft/s	Vapor MW	54.05				
Outlet Flow Velocity 778.20	ft/s	Vapor Z	0.77				
Minimum Temperature 148.4	°F	Vapor k	1.27				
Temp Out of Device 153.8	°F	Vapor Viscosity	0.01	cР			
Kc 1.000		С	0.00 344.13				
Kd 0.975 Kb	1.000	Kb Method					



Pressure Safety Valve

Sun Marketing and Refining Company Philadelphia - Girard Point 433 HF Alkylation

28PSV-5

Treater Feed Surge Drum (V-1)

P&ID No. G-22016

ISO No. Iso 2

	Non-desi	gn Sizing		
Scenario: Other: Inadvertent opening of	control valve bypass (1), on V-0001		43,186 lb/l
Sizing Method: Homogeneous Equi	librium Method (HEM) Sizing	Pressure drop base	ed on required rat
Required Relief Rate 43,1	86 lb/hr	Fluid Relieved	Stream 2	
Device Capacity 303,0	93 lb/hr	Fluid Phase	Liquid	
Required Area 0.4	.07 in²	Relief Pressure	170.5	psig
Device Actual Area 2.8	53 in ²	% Overpressure	10	%
Inlet PDrop 0.4 psi (0.3 % of Set)	Relief Temperature	90.1	°F
Outlet PDrop 1.2 psi (0.8 % of Set)	Mass % Vapor	0.00	%
Inlet Flow Velocity 6	.92 ft/s	Vapor MW		
Outlet Flow Velocity 129	.02 ft/s	Liquid Gravity	0.54	
Minimum Temperature 3.	4.0 °F	Liquid Viscosity	0.16	cР
Temp Out of Device	°F	Liquid Vapor Pressure	33.60	psig
Kc 1.000 Kv	1.000	Mass Flux	6,537.60 lb/s-ft ²	
Kd 0.650 Kb	1.000	Kb Method		
Scenario: Failure of automatic controls	(2), on V-0001	•		43,186 lb/
Sizing Method: Homogeneous Equi	librium Method (HEM	() Sizing	Pressure drop base	ed on required ra
Required Relief Rate 43,1	86 lb/hr	Fluid Relieved	Stream 2	
Device Capacity 302,9	75 lb/hr	Fluid Phase	Liquid	
Required Area 0.4	.07 in²	Relief Pressure	170.5	psig
Device Actual Area 2.8	53 in ²	% Overpressure	10	%
Inlet PDrop 0.4 psi (0.3 % of Set)	Relief Temperature	90.1	°F
	0.8 % of Set)	Mass % Vapor	0.00	%
Inlet Flow Velocity 6.	.93 ft/s	Vapor MW		
Outlet Flow Velocity 128		Liquid Gravity	0.54	
	4.0 °F	Liquid Viscosity	0.16	cР
Minimum Temperature 3.		-		psig
Minimum Temperature 3- Temp Out of Device	°F	Liquid Vapor Pressure	33.50	
	°F 1.000	Liquid Vapor Pressure Mass Flux	6,535.10 lb/s-ft ²	parg



Pressure Safety Valve

Sun Marketing and Refining Company Philadelphia - Girard Point 433 HF Alkylation

28PSV-5

Treater Feed Surge Drum (V-1)

P&ID No. G-22016

ISO No. Iso 2

Scenario: Other: Inadvertent opening of control valve bypass (2), on V-0001 52,343 lb/hr							
Sizing Method: Homogeneous Equilibrium Method (HE	M) Sizing	Pressure drop bas	ed on required rate				
Required Relief Rate 61,275 lb/hr	Fluid Relieved	Stream 3					
Device Capacity 277,205 lb/hr	Fluid Phase	Liquid					
Required Area 0.631 in ²	Relief Pressure	170.5	psig				
Device Actual Area 2.853 in ²	% Overpressure	10	%				
Inlet PDrop 0.4 psi (0.3 % of Set)	Relief Temperature	90.0	°F				
Outlet PDrop 5.9 psi (3.8 % of Set)	Mass % Vapor	0.00	%				
Inlet Flow Velocity 10.48 ft/s	Vapor MW						
Outlet Flow Velocity 179.86 ft/s	Liquid Gravity	0.51					
Minimum Temperature 18.7 °F	Liquid Viscosity	0.15	cР				
Temp Out of Device °F	Liquid Vapor Pressure	48.20	psig				
Kc 1.000 Kv 1.000	Mass Flux	5,979.20 lb/s-ft ²					
Kd 0.650 Kb 1.000	Kb Method						
0.050							
Scenario: Failure of automatic controls (3), on V-0001			52,343 lb/hr				
Scenario: Failure of automatic controls (3), on V-0001 Sizing Method: Homogeneous Equilibrium Method (HE	M) Sizing	Pressure drop bas	52,343 lb/hr ed on required rate				
Tundre of automatic controls (5), on v ooor	M) Sizing Fluid Relieved	Pressure drop bas	,				
Sizing Method: Homogeneous Equilibrium Method (HE			,				
Sizing Method: Homogeneous Equilibrium Method (HE Required Relief Rate 52,343 lb/hr	Fluid Relieved	Stream 3	,				
Sizing Method: Homogeneous Equilibrium Method (HE Required Relief Rate 52,343 lb/hr Device Capacity 277,103 lb/hr	Fluid Relieved Fluid Phase	Stream 3 Liquid	ed on required rate				
Sizing Method: Homogeneous Equilibrium Method (HE Required Relief Rate 52,343 lb/hr Device Capacity 277,103 lb/hr Required Area 0.539 in²	Fluid Relieved Fluid Phase Relief Pressure	Stream 3 Liquid 170.5	ed on required rate				
Sizing Method: Homogeneous Equilibrium Method (HE Required Relief Rate 52,343 lb/hr Device Capacity 277,103 lb/hr Required Area 0.539 in² Device Actual Area 2.853 in²	Fluid Relieved Fluid Phase Relief Pressure % Overpressure	Stream 3 Liquid 170.5	ed on required rate psig %				
Sizing Method: Homogeneous Equilibrium Method (HE Required Relief Rate 52,343 lb/hr Device Capacity 277,103 lb/hr Required Area 0.539 in² Device Actual Area 2.853 in² Inlet PDrop 0.4 psi (0.3 % of Set)	Fluid Relieved Fluid Phase Relief Pressure % Overpressure Relief Temperature	Stream 3 Liquid 170.5 10 90.1	ed on required rate psig % °F				
Sizing Method: Homogeneous Equilibrium Method (HE Required Relief Rate 52,343 lb/hr Device Capacity 277,103 lb/hr Required Area 0.539 in² Device Actual Area 2.853 in² Inlet PDrop 0.4 psi (0.3 % of Set) Outlet PDrop 3.1 psi (2.0 % of Set)	Fluid Relieved Fluid Phase Relief Pressure % Overpressure Relief Temperature Mass % Vapor	Stream 3 Liquid 170.5 10 90.1	ed on required rate psig % °F				
Sizing Method: Homogeneous Equilibrium Method (HE Required Relief Rate 52,343 lb/hr Device Capacity 277,103 lb/hr Required Area 0.539 in² Device Actual Area 2.853 in² Inlet PDrop 0.4 psi (0.3 % of Set) Outlet PDrop 3.1 psi (2.0 % of Set) Inlet Flow Velocity 8.95 ft/s	Fluid Relieved Fluid Phase Relief Pressure % Overpressure Relief Temperature Mass % Vapor Vapor MW	Stream 3 Liquid 170.5 10 90.1 0.00	ed on required rate psig % °F				
Sizing Method: Homogeneous Equilibrium Method (HE Required Relief Rate 52,343 lb/hr Device Capacity 277,103 lb/hr Required Area 0.539 in² Device Actual Area 2.853 in² Inlet PDrop 0.4 psi (0.3 % of Set) Outlet PDrop 3.1 psi (2.0 % of Set) Inlet Flow Velocity 8.95 ft/s Outlet Flow Velocity 186.40 ft/s	Fluid Relieved Fluid Phase Relief Pressure % Overpressure Relief Temperature Mass % Vapor Vapor MW Liquid Gravity	Stream 3 Liquid 170.5 10 90.1 0.00	psig % °F %				
Sizing Method: Homogeneous Equilibrium Method (HE Required Relief Rate 52,343 lb/hr Device Capacity 277,103 lb/hr Required Area 0.539 in² Device Actual Area 2.853 in² Inlet PDrop 0.4 psi (0.3 % of Set) Outlet PDrop 3.1 psi (2.0 % of Set) Inlet Flow Velocity 8.95 ft/s Outlet Flow Velocity 186.40 ft/s Minimum Temperature 18.7 °F	Fluid Relieved Fluid Phase Relief Pressure % Overpressure Relief Temperature Mass % Vapor Vapor MW Liquid Gravity Liquid Viscosity	Stream 3 Liquid 170.5 10 90.1 0.00 0.51 0.15	psig % °F %				
Sizing Method: Homogeneous Equilibrium Method (HE Required Relief Rate 52,343 lb/hr Device Capacity 277,103 lb/hr Required Area 0.539 in² Device Actual Area 2.853 in² Inlet PDrop 0.4 psi (0.3 % of Set) Outlet PDrop 3.1 psi (2.0 % of Set) Inlet Flow Velocity 8.95 ft/s Outlet Flow Velocity 186.40 ft/s Minimum Temperature 18.7 °F Temp Out of Device °F	Fluid Relieved Fluid Phase Relief Pressure % Overpressure Relief Temperature Mass % Vapor Vapor MW Liquid Gravity Liquid Viscosity Liquid Vapor Pressure	Stream 3 Liquid 170.5 10 90.1 0.00 0.51 0.15 48.30	psig % °F %				



Pressure Safety Valve

Sun Marketing and Refining Company Philadelphia - Girard Point 433 HF Alkylation

28PSV-5

Treater Feed Surge Drum (V-1)

P&ID No. G-22016

ISO No. Iso 2

Scenario: Failure of automatic controls (1), on V-0001			64,523 lb/hr				
Sizing Method: Homogeneous Equilibrium Method (HE	M) Sizing	Pressure drop base	ed on required rate				
Required Relief Rate 64,523 lb/hr	Fluid Relieved	Stream 1					
Device Capacity 294,316 lb/hr	Fluid Phase	Liquid					
Required Area 0.625 in ²	Relief Pressure	187.6	psig				
Device Actual Area 2.853 in ²	% Overpressure	21	%				
Inlet PDrop 0.4 psi (0.3 % of Set)	Relief Temperature	90.2	°F				
Outlet PDrop 7.2 psi (4.6 % of Set)	Mass % Vapor	0.00	%				
Inlet Flow Velocity 11.05 ft/s	Vapor MW						
Outlet Flow Velocity 177.33 ft/s	Liquid Gravity	0.51					
Minimum Temperature 18.0 °F	Liquid Viscosity	0.15	cР				
Temp Out of Device °F	Liquid Vapor Pressure	49.50	psig				
Kc 1.000 Kv 1.000	Mass Flux	6,348.30 lb/s-ft ²					
Kd 0.650 Kb 1.000	Kb Method						
0.050							
Scenario: Failure of automatic controls: Inadvertent opening	of control valve bypass (4), o	on V-0001	80,813 lb/hr				
Scenario: Failure of automatic controls: Inadvertent opening Sizing Method: Homogeneous Equilibrium Method (HE			80,813 lb/hr ed on required rate				
randre of automatic controls, madvertent opening			,				
Sizing Method: Homogeneous Equilibrium Method (HE	M) Sizing	Pressure drop base	,				
Sizing Method: Homogeneous Equilibrium Method (HE Required Relief Rate 80,813 lb/hr	M) Sizing Fluid Relieved	Pressure drop base	ed on required rate				
Sizing Method: Homogeneous Equilibrium Method (HE Required Relief Rate 80,813 lb/hr Device Capacity 275,450 lb/hr Required Area 0.837 in ²	M) Sizing Fluid Relieved Fluid Phase	Pressure drop base Stream 1 Liquid	,				
Sizing Method: Homogeneous Equilibrium Method (HE Required Relief Rate 80,813 lb/hr Device Capacity 275,450 lb/hr Required Area 0.837 in² Device Actual Area 2.853 in²	M) Sizing Fluid Relieved Fluid Phase Relief Pressure	Pressure drop base Stream 1 Liquid 170.5	ed on required rate				
Sizing Method: Homogeneous Equilibrium Method (HE Required Relief Rate 80,813 lb/hr Device Capacity 275,450 lb/hr Required Area 0.837 in² Device Actual Area 2.853 in² Inlet PDrop 0.5 psi (0.3 % of Set)	M) Sizing Fluid Relieved Fluid Phase Relief Pressure % Overpressure	Pressure drop base Stream 1 Liquid 170.5	ed on required rate psig %				
Sizing Method: Homogeneous Equilibrium Method (HE Required Relief Rate 80,813 lb/hr Device Capacity 275,450 lb/hr Required Area 0.837 in² Device Actual Area 2.853 in² Inlet PDrop 0.5 psi (0.3 % of Set) Outlet PDrop 17.0 psi (11.0 % of Set)	M) Sizing Fluid Relieved Fluid Phase Relief Pressure % Overpressure Relief Temperature	Pressure drop base Stream 1 Liquid 170.5 10 90.2	ed on required rate psig % °F				
Sizing Method: Homogeneous Equilibrium Method (HE Required Relief Rate 80,813 lb/hr Device Capacity 275,450 lb/hr Required Area 0.837 in² Device Actual Area 2.853 in² Inlet PDrop 0.5 psi (0.3 % of Set) Outlet PDrop 17.0 psi (11.0 % of Set) Inlet Flow Velocity 13.83 ft/s	Fluid Relieved Fluid Phase Relief Pressure % Overpressure Relief Temperature Mass % Vapor	Pressure drop base Stream 1 Liquid 170.5 10 90.2	ed on required rate psig % °F				
Sizing Method: Homogeneous Equilibrium Method (HE Required Relief Rate 80,813 lb/hr Device Capacity 275,450 lb/hr Required Area 0.837 in² Device Actual Area 2.853 in² Inlet PDrop 0.5 psi (0.3 % of Set) Outlet PDrop 17.0 psi (11.0 % of Set) Inlet Flow Velocity 13.83 ft/s	M) Sizing Fluid Relieved Fluid Phase Relief Pressure % Overpressure Relief Temperature Mass % Vapor Vapor MW	Pressure drop base Stream 1 Liquid 170.5 10 90.2 0.00	ed on required rate psig % °F				
Sizing Method: Homogeneous Equilibrium Method (HE Required Relief Rate 80,813 lb/hr Device Capacity 275,450 lb/hr Required Area 0.837 in² Device Actual Area 2.853 in² Inlet PDrop 0.5 psi (0.3 % of Set) Outlet PDrop 17.0 psi (11.0 % of Set) Inlet Flow Velocity 13.83 ft/s Outlet Flow Velocity 114.28 ft/s	Fluid Relieved Fluid Phase Relief Pressure % Overpressure Relief Temperature Mass % Vapor Vapor MW Liquid Gravity	Pressure drop base Stream 1 Liquid 170.5 10 90.2 0.00	psig % °F %				
Sizing Method: Homogeneous Equilibrium Method (HE Required Relief Rate 80,813 lb/hr Device Capacity 275,450 lb/hr Required Area 0.837 in² Device Actual Area 2.853 in² Inlet PDrop 0.5 psi (0.3 % of Set) Outlet PDrop 17.0 psi (11.0 % of Set) Inlet Flow Velocity 13.83 ft/s Outlet Flow Velocity 114.28 ft/s Minimum Temperature 18.0 °F Temp Out of Device °F	Fluid Relieved Fluid Phase Relief Pressure % Overpressure Relief Temperature Mass % Vapor Vapor MW Liquid Gravity Liquid Viscosity	Pressure drop base Stream 1 Liquid 170.5 10 90.2 0.00 0.51 0.15	psig % °F %				
Sizing Method: Homogeneous Equilibrium Method (HE Required Relief Rate 80,813 lb/hr Device Capacity 275,450 lb/hr Required Area 0.837 in² Device Actual Area 2.853 in² Inlet PDrop 0.5 psi (0.3 % of Set) Outlet PDrop 17.0 psi (11.0 % of Set) Inlet Flow Velocity 13.83 ft/s Outlet Flow Velocity 114.28 ft/s Minimum Temperature 18.0 °F Temp Out of Device °F	Fluid Relieved Fluid Phase Relief Pressure % Overpressure Relief Temperature Mass % Vapor Vapor MW Liquid Gravity Liquid Viscosity Liquid Vapor Pressure	Pressure drop base Stream 1 Liquid 170.5 10 90.2 0.00 0.51 0.15 49.50	psig % °F %				



Pressure Safety Valve

Sun Marketing and Refining Company Philadelphia - Girard Point 433 HF Alkylation

28PSV-5

Treater Feed Surge Drum (V-1)

P&ID No. G-22016

ISO No. Iso 2

Scenario: Overfilling of vessel (1), on V-0001 180,341 lb/h						
Sizing Method: Homogeneou	s Equilibrium Method (HEM) Sizing	Pressure drop based	on actual capacity		
Required Relief Rate	180,341 lb/hr	Fluid Relieved	Stream 6			
Device Capacity	273,037 lb/hr	Fluid Phase	Liquid			
Required Area	1.884 in ²	Relief Pressure	170.5	psig		
Device Actual Area	2.853 in ²	% Overpressure	10	%		
Inlet PDrop 5.2 psi	(3.4 % of Set)	Relief Temperature	90.0	°F		
Outlet PDrop 49.7 psi	(32.1 % of Set)	Mass % Vapor	0.00	%		
Inlet Flow Velocity	44.87 ft/s	Vapor MW				
Outlet Flow Velocity	26.10 ft/s	Liquid Gravity	0.53			
Minimum Temperature	21.2 °F	Liquid Viscosity	0.15	cР		
Temp Out of Device	°F	Liquid Vapor Pressure	49.00	psig		
Kc 1.000 Kv	1.000	Mass Flux	5,889.30 lb/s-ft ²			
Kd 0.650 Kb	1.000	Kb Method				



Pressure Safety Valve

Sun Marketing and Refining Company Philadelphia - Girard Point 433 HF Alkylation

28PSV-5

Treater Feed Surge Drum (V-1)

P&ID No. G-22016

ISO No. Iso 2

		Piping					
Inlet Piping							
	Pipe / Fitting	d/D	LEq				
1	1 x 3", Sch40 Slightly Rounded Entrance		3.40 ft				
2	1.00 ft of 3", Sch40 Pipe		1.00 ft				
3	1 x 3", Sch40 Welded Tee Through Run		5.11 ft				
4	3.00 ft of 3", Sch40 Pipe		3.00 ft				
	Total Equivalent Length		12.51 ft				
0	utlet Piping						
	Pipe / Fitting	d/D	LEq	Delta Z			
1	3.00 ft of 4", Sch40 Pipe		3.00 ft	0.00 ft			
2	1 x 4", Sch40 Welded Tee Through Run		6.71 ft				
3	2.00 ft of 4", Sch40 Pipe		2.00 ft	0.00 ft			
4	1.00 ft of 4", Sch40 Pipe		1.00 ft	0.00 ft			
5	1 x 4", Sch40 ANSI Enlargement	0.50	14.84 ft				
6	5.00 ft of 8", Sch40 Pipe		0.14 ft	0.00 ft			
7	1 x 8", Sch40 90-Deg Long Radius Elbow		0.23 ft				
8	10.00 ft of 8", Sch40 Pipe		0.28 ft	0.00 ft			
9	1 x 8", Sch40 45-Deg Welded Elbow		0.30 ft				
10	5.00 ft of 8", Sch40 Pipe		0.14 ft	0.00 ft			
11	1 x 8", Sch40 Sudden Enlargement	0.50	0.76 ft				
	Total Equivalent Length		29.40 ft				



Pressure Safety Valve

Sun Marketing and Refining Company Philadelphia - Girard Point 433 HF Alkylation

28PSV-5

Treater Feed Surge Drum (V-1)

P&ID No. **G-22016**

ISO No. Iso 2

	Relief Dev	vice Information					
Manufacturer	Consolidated	Opening Pressure	155.0	psig			
Model Number	1906-30LC-1-CC-MS-31-RF-L	Constant Back Pressure	2.0	psig			
Device Number	TC85954	Cold Differential Set P	151.0	psi			
Size	3" x 4"	Operating Pressure	65.0	psig			
Flange Rating	ANSI 300 RF x ANSI 150 RF	Operating Temperature	90.0	°F			
Safety / Relief	Safety	Code	ASME VIII				
Туре	Balanced Bellows	Stamp	UV				
Orifice API Letter	L	Blowdown		%			
Orifice Size	2.853 in ²	Rupture Disk on Inlet	N	Ю			
		Discharge to	T-3 Acid Neu	ıtralizer			
Materi	ials of Construction	A	Accessories				
Body/Bonnet	Carbon Steel	Nozzle					
Seal/Disk	316 Stainless Steel	Сар					
Guide/Rings	316 Stainless Steel	Bonnet					
Spring	Alloy Steel	Lever					
Bellows	•	Gag					
Resilient Seat Surface	316 Stainless Steel	Vent w/ Bug Screen					
	Protecto	ed Equipment					
Tag Number	Description		P&ID				
V-0001	Treater Feed Surge Drum		G-22016				
	Co	omments					
SO-4136 provides adequa	ate relief capacity for all identified overpr	ressure scenarios.					
			Revision No.	0			
			KKN	07/16/2001			

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Pressure Safety Valve

Sun Marketing and Refining Company Philadelphia - Girard Point 433 HF Alkylation

28PSV-5

Treater Feed Surge Drum (V-1)

P&ID No. G-22016

ISO No. Iso 2

Design Basis							
Scenario: External fire (1), on V-0001 59,332 lb/hr							
Sizing Method: API 52	0 Vapor Sizing	_	Pressure drop based	on actual capacity			
Required Relief Rate	59,332 lb/hr	Fluid Relieved	Stream 6				
Device Capacity	62,592 lb/hr	Fluid Phase	Vapor				
Required Area	2.704 in ²	Relief Pressure	187.6	psig			
Device Actual Area	2.853 in ²	% Overpressure	21	%			
Inlet PDrop 4.4 psi	(2.8 % of Set)	Relief Temperature	183.5	°F			
Outlet PDrop 31.0 psi	(20.0 % of Set)	Mass % Vapor	100.00	%			
Inlet Flow Velocity	168.27 ft/s	Vapor MW	54.05				
Outlet Flow Velocity	778.20 ft/s	Vapor Z	0.77				
Minimum Temperature	148.4 °F	Vapor k	1.27				
Temp Out of Device	153.8 °F	Vapor Viscosity	0.01	cP			
Kc 1.000		С	0.00 344.13				
Kd 0.975 KI	1.000	Kb Method					



Pressure Safety Valve

Sun Marketing and Refining Company Philadelphia - Girard Point 433 HF Alkylation

28PSV-5

Treater Feed Surge Drum (V-1)

P&ID No. G-22016

ISO No. Iso 2

		Piping					
ln	let Piping						
	Pipe / Fitting	d/D	LEq				
1	1 x 3", Sch40 Slightly Rounded Entrance		3.40 ft				
2 1.00 ft of 3", Sch40 Pipe			1.00 ft				
3 1 x 3", Sch40 Welded Tee Through Run			5.11 ft				
4	3.00 ft of 3", Sch40 Pipe		3.00 ft				
	Total Equivalent Length		12.51 ft				
0	utlet Piping						
	Pipe / Fitting	d/D	LEq	Delta Z			
1	3.00 ft of 4", Sch40 Pipe		3.00 ft	0.00 ft			
2	1 x 4", Sch40 Welded Tee Through Run		6.71 ft				
3	2.00 ft of 4", Sch40 Pipe		2.00 ft	0.00 ft			
4	1.00 ft of 4", Sch40 Pipe		1.00 ft	0.00 ft			
5	1 x 4", Sch40 ANSI Enlargement	0.50	14.84 ft				
6	5.00 ft of 8", Sch40 Pipe		0.14 ft	0.00 ft			
7	1 x 8", Sch40 90-Deg Long Radius Elbow		0.23 ft				
8	10.00 ft of 8", Sch40 Pipe		0.28 ft	0.00 ft			
9	1 x 8", Sch40 45-Deg Welded Elbow		0.30 ft				
10	5.00 ft of 8", Sch40 Pipe		0.14 ft	0.00 ft			
11	1 x 8", Sch40 Sudden Enlargement	0.50	0.76 ft				
	Total Equivalent Length		29.40 ft				



Pressure Safety Valve

Sun Marketing and Refining Company Philadelphia - Girard Point 433 HF Alkylation

28PSV-5

Treater Feed Surge Drum (V-1)

P&ID No. **G-22016**

		Scenario	nformation			
Scenario: External	fire (1) on V-0001					
Relief Conditions -	Temperature	183.5 °F	Pressure	187.6 psig	% Vapor	100.00
Relief Rate -	Required	59,331.5 lb/hr	Capacity	62,591.8 lb/hr		
		Relief Stream	Composition			
Chemical Name	Chemical Formula	Mole Fraction	Chemical Name		Chemical Formula	Mole Fraction
CIS-2-BUTENE	C4H8	0.305	CIS-2-PENTENE		C5H1O	0.006
ISOBUTANE	C4H1O	0.321	N-BUTANE		C4H1O	0.113
N-PENTANE	C5H12	0.001	PROPANE		СЗН8	0.179
PROPYLENE	С3Н6	0.071	NBP_125		Pseudo125	0.001
NBP_175	Pseudo175	0.001	NBP_225		Pseudo225	0.001
		Scenario	nformation			
Scenario: Overfilli						
	ing of vessel (1) on V-0001					
Relief Conditions -	ing of vessel (1) on V-0001 Temperature	90.0 °F	Pressure	170.5 psig	% Vapor	0.00
Relief Conditions -	Temperature	90.0 °F 180,340.9 lb/hr	Pressure Capacity	170.5 psig 273,037.4 lb/hr	% Vapor	0.00
	Temperature	180,340.9 lb/hr			% Vapor	0.00
	Temperature	180,340.9 lb/hr	Capacity		% Vapor Chemical Formula	0.00 Mole Fraction
Relief Rate -	Temperature Required Chemical	180,340.9 lb/hr Relief Stream Mole	Capacity Composition		Chemical	Mole
Relief Rate -	Temperature Required Chemical Formula	180,340.9 lb/hr Relief Stream Mole Fraction	Capacity Composition Chemical Name		Chemical Formula	Mole Fraction
Relief Rate - Chemical Name CIS-2-BUTENE	Temperature Required Chemical Formula C4H8	Relief Stream Mole Fraction 0.371	Capacity Composition Chemical Name CIS-2-PENTENE		Chemical Formula	Mole Fraction 0.013
Relief Rate - Chemical Name CIS-2-BUTENE ISOBUTANE	Temperature Required Chemical Formula C4H8 C4H1O	Mole Fraction 0.371 0.310	Capacity Composition Chemical Name CIS-2-PENTENE N-BUTANE		Chemical Formula C5H1O	Mole Fraction 0.013 0.131
Chemical Name CIS-2-BUTENE ISOBUTANE N-PENTANE	Temperature Required Chemical Formula C4H8 C4H10 C5H12	Mole Fraction 0.371 0.310 0.002	Capacity Composition Chemical Name CIS-2-PENTENE N-BUTANE PROPANE		Chemical Formula C5H1O C4H1O	Mole Fraction 0.013 0.131 0.106
Relief Rate - Chemical Name CIS-2-BUTENE ISOBUTANE N-PENTANE PROPYLENE	Temperature Required Chemical Formula C4H8 C4H10 C5H12 C3H6	Mole Fraction 0.371 0.310 0.002 0.039	Capacity Composition Chemical Name CIS-2-PENTENE N-BUTANE PROPANE NBP_125		Chemical Formula C5H1O C4H1O C3H8 Pseudo125	Mole Fraction 0.013 0.131 0.106 0.003



Pressure Safety Valve

Sun Marketing and Refining Company Philadelphia - Girard Point 433 HF Alkylation

28PSV-5

Treater Feed Surge Drum (V-1)

P&ID No. **G-22016**

		Scenario I	nformation			
Scenario: Failure	of automatic controls (1) on V-00	01				
Relief Conditions -	Temperature	90.2 °F	Pressure	187.6 psig	% Vapor	0.00
Relief Rate -	Required	64,522.7 lb/hr	Capacity	294,315.9 lb/hr		
		Relief Stream	Composition			
Chemical Name	Chemical Formula	Mole Fraction	Chemical Name		Chemical Formula	Mole Fraction
ISOBUTANE	C4H1O	0.618	N-BUTANE		C4H1O	0.309
PROPANE	СЗН8	0.073				
	nadvertent opening of control val		nformation 001			
Relief Conditions -	Temperature	90.1 °F	Pressure	170.5 psig	% Vapor	0.00
Relief Rate -	Required	43,186.0 lb/hr	Capacity	303,092.6 lb/hr	70 Vapor	0.00
			Composition	200,002.0 10,111		
Chemical Name	Chemical Formula	Mole Fraction	Chemical Name		Chemical Formula	Mole Fraction
CIS-2-BUTENE	C4H8	0.479	CIS-2-PENTENE		C5H1O	0.020
CIO 2 DO ILIAL						
ISOBUTANE	C4H1O	0.364	N-BUTANE		C4H1O	0.075
	C4H1O C5H12	0.364 0.003	N-BUTANE PROPANE		C4H1O C3H8	0.075
ISOBUTANE N-PENTANE						
ISOBUTANE N-PENTANE PROPYLENE	C5H12	0.003	PROPANE		С3Н8	0.009
ISOBUTANE	C5H12 C3H6	0.003 0.009	PROPANE NBP_125		C3H8 Pseudo125	0.009



Pressure Safety Valve

Sun Marketing and Refining Company Philadelphia - Girard Point 433 HF Alkylation

28PSV-5

Treater Feed Surge Drum (V-1)

P&ID No. **G-22016**

		Scenario	Information			
Scenario: Other: In	nadvertent opening of control val	ve bypass (2) on V-0	0001			
Relief Conditions -	Temperature	90.0 °F	Pressure	170.5 psig	% Vapor	0.00
Relief Rate -	Required	61,274.9 lb/hr	Capacity	277,204.8 lb/hr		
		Relief Stream	n Composition			
Chemical Name	Chemical Formula	Mole Fraction	Chemical Name		Chemical Formula	Mole Fraction
ISOBUTANE	C4H1O	0.627	N-BUTANE		C4H1O	0.311
PROPANE	С3Н8	0.062				
Scenario: Failure	of automatic controls (2) on V-00		Information			
Relief Conditions -	Temperature	90.1 °F	Pressure	170.5 psig	% Vapor	0.00
Relief Rate -	Required	43,186.0 lb/hr	Capacity	302,975.3 lb/hr	· ·	
		Relief Stream	n Composition			
Chemical Name	Chemical Formula	Mole Fraction	Chemical Name		Chemical Formula	Mole Fraction
CIS-2-BUTENE	C4H8	0.479	CIS-2-PENTENE		C5H1O	0.020
ISOBUTANE	C4H1O	0.364	N-BUTANE		C4H1O	0.075
N-PENTANE	C5H12	0.003	PROPANE		СЗН8	0.009
PROPYLENE	С3Н6	0.009	NBP_125		Pseudo125	0.005
NBP_150	Pseudo150	0.002	NBP_175		Pseudo175	0.005
	D 1 200	0.004	NBP_225		Pseudo225	0.020
NBP_200	Pseudo200	0.004	NBI _223		1 seudo223	0.020



Pressure Safety Valve

Sun Marketing and Refining Company Philadelphia - Girard Point 433 HF Alkylation

28PSV-5

Treater Feed Surge Drum (V-1)

P&ID No. **G-22016**

		Scenario	Information				
Scenario: Failure	of automatic controls (3) on V-00	001					
Relief Conditions -	Temperature	90.1 °F	Pressure	170.5	psig	% Vapor	0.00
Relief Rate -	Required	52,342.9 lb/hr	Capacity	277,103.4	lb/hr		
		Relief Stream	Composition				
Chemical Name	Chemical Formula	Mole Fraction	Chemical Name			Chemical Formula	Mole Fraction
ISOBUTANE	C4H1O	0.627	N-BUTANE			C4H1O	0.311
PROPANE	C3H8	0.062					
		Scenario	Information				
Scenario: Failure	of automatic controls (4) on V-00	001					
Relief Conditions -	Temperature	90.2 °F	Pressure	170.5	psig	% Vapor	0.0
Relief Rate -	Required	80,813.2 lb/hr	Capacity	275,449.5	lb/hr		
		Relief Stream	Composition				
	Chemical Formula	Mole Fraction	Chemical Name			Chemical Formula	Mole Fraction
Chemical Name						C4H1O	0.309
ISOBUTANE	C4H1O	0.618	N-BUTANE			С4ПТО	0.309