

TEG DEHYDRATION PACKAGE

Piping Analysis Report

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1. SCOPE

The purpose of this document is to perform the piping flexibility analysis for the interconnecting piping system of subject job to confirm the stresses are within the code limit, and thus satisfy designated codes and practice.

2. CODES, STANDARDS AND REFERENCE DOCUMENTS

2.1 International Codes and Standards

Standard Numbers	Standard Title
ASME B31.3	Process Piping
ASME B36.10	Welded and Seamless Wrought Steel Pipe
ASME B36.19	Dimensional standards for stainless steel pipes
ASME B16.5	Pipe Flanges And Flange Fittings
ASME B16.9	Factory made Wrought Steel Butt welding Fittings
ASTM A 106	Standard Specification for Pipe, seamless carbon steel pipe for high temperature service
ASTM A 105	Standard Specification for Carbon Steel Forgings for Piping Applications
ASTM A 234	Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
ASTM A 312	Standard Specification for seamless and welded austenitic stainless steel pipes
ASTM A 403	Standard Specification for wrought austenitic stainless steel piping fittings
ASTM A 182	Standard Specification for forged or rolled alloy & stainless steel pipe flanges, forged fittings and valves and parts for high temperature service

2.2 Project Reference Documents

Document Title

Piping Isometric Drawings

Equipment GA - Nozzle Load Details

3. DESIGN BASIS

The Piping Analysis has been carried out in accordance with the design code ASME B31.3

Pipe Joints for the fittings are welded joints.

Installation Temperature is 66 Deg F.

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3.1 Process and Piping Details

System-1&2

Reference Drawing: V-215A-001-A-311 – (1942DP300 SHT 1 OF 1, 1942DP301 SHT 1 OF 1)

Service		P
Fluid Density	KG/M ³	19.222
Design Pressure	PSIG	600
Design Temperature (Max)	°F	210
Design Temperature (Min)	°F	(-)20
Test Pressure	PSIG	900
Pipe Size	NPS	16
Schedule		40
Flange Rating	CLASS	300
Corrosion Allowance	MM	1.6
Pipe Material		A 106 Gr B
Insulation Type		N/A
Insulation Thickness	MM	N/A

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System-3

Reference Drawing: V-215A-001-A-311 – (1942DP100 SHT 1 OF 2, 1942DP100 SHT 2 OF 2, 1942DP112 SHT 1 OF 2, 1942DP112 SHT 2 OF 2, 1942DP123 SHT 1 OF 2, 1942DP123 SHT 2 OF 2, 1942DP124 SHT 1 OF 1, 1942DP154 SHT 1 OF 1, 1942DP160 SHT 1 OF 1, 1942DP155 SHT 1 OF 1, 1942DP400 SHT 1 OF 1, 1942DP161 SHT 1 OF 1, 1942DP403 SHT 1 OF 1)

Service		RG
Fluid Density	KG/M ³	1063.626
Design Pressure	PSIG	630
Design Temperature (Max)	°F	248
Design Temperature (Min)	°F	18
Test Pressure	PSIG	945
Pipe Size	NPS	2
Schedule		80
Flange Rating	CLASS	600/300/150
Corrosion Allowance	MM	1.6
Pipe Material		A 106 Gr B
Insulation Type		PP
Insulation Thickness	MM	25.4

System-4

Reference Drawing: V-215A-001-A-311 – (1942DP303 SHT 1 OF 2, 1942DP303 SHT 2 OF 2)

Service		P
Fluid Density	KG/M ³	19.222
Design Pressure	PSIG	600
Design Temperature (Max)	°F	210
Design Temperature (Min)	°F	-20
Test Pressure	PSIG	900
Pipe Size	NPS	8
Schedule		40
Flange Rating	CLASS	300/150
Corrosion Allowance	MM	1.6
Pipe Material		A 106 Gr B
Insulation Type		N/A
Insulation Thickness	MM	N/A

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System-5

Reference Drawing: V-215A-001-A-311 – (1942DP107 SHT 1 OF 2, 1942DP107 SHT 2 OF 2)

Service		RG
Fluid Density	KG/M ³	919.459
Design Pressure	PSIG	101.5
Design Temperature (Max)	°F	446
Design Temperature (Min)	°F	18
Test Pressure	PSIG	153
Pipe Size	NPS	4
Schedule		40
Flange Rating	CLASS	300/150
Corrosion Allowance	MM	1.6
Pipe Material		A 106 Gr B
Insulation Type		HC
Insulation Thickness	MM	25.4

System-6

Reference Drawing: V-215A-001-A-311 – (1942DP108 SHT 1 OF 1)

Service		LG
Fluid Density	KG/M ³	985.135
Design Pressure	PSIG	101.5
Design Temperature (Max)	°F	446
Design Temperature (Min)	°F	18
Test Pressure	PSIG	153
Pipe Size	NPS	4
Schedule		40
Flange Rating	CLASS	300/150
Corrosion Allowance	MM	1.6
Pipe Material		A 106 Gr B
Insulation Type		HC
Insulation Thickness	MM	38.1

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System-7

Reference Drawing: V-215A-001-A-311 – (1942DP116 SHT 1 OF 1)

Service		P
Fluid Density	KG/M ³	13.583
Design Pressure	PSIG	101.5
Design Temperature (Max)	°F	446
Design Temperature (Min)	°F	18
Test Pressure	PSIG	153
Pipe Size	NPS	4
Schedule		40
Flange Rating	CLASS	150
Corrosion Allowance	MM	1.6
Pipe Material		A 106 Gr B
Insulation Type		HC
Insulation Thickness	MM	50.8

System-8

Reference Drawing: V-215A-001-A-311 – (1942DP117 SHT 1 OF 1)

Service		P
Fluid Density	KG/M ³	10.181
Design Pressure	PSIG	50
Design Temperature (Max)	°F	446
Design Temperature (Min)	°F	18
Test Pressure	PSIG	75
Pipe Size	NPS	2
Schedule		80
Flange Rating	CLASS	150
Corrosion Allowance	MM	1.6
Pipe Material		A 106 Gr B
Insulation Type		HC
Insulation Thickness	MM	25.4

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System-9

Reference Drawing: V-215A-001-A-311 – (1942DP120 SHT 1 OF 1, 1942DP408 SHT 1 OF 1)

Service		P
Fluid Density	LB/FT ³	19.222
Design Pressure	PSIG	101.5
Design Temperature (Max)	°F	210
Design Temperature (Min)	°F	18
Test Pressure	PSIG	153
Pipe Size	NPS	3
Schedule		40
Flange Rating	CLASS	150
Corrosion Allowance	MM	1.6
Pipe Material		A 106 Gr B
Insulation Type		N/A
Insulation Thickness	INCH	N/A

System-10

Reference Drawing: V-215A-001-A-311 – (1942DP104 SHT 1 OF 2, 1942DP104 SHT 2 OF 2, 1942DP105 SHT 1 OF 2, 1942DP105 SHT 2 OF 2, 1942DP121 SHT 1 OF 2, 1942DP121 SHT 2 OF 2, 1942DP122 SHT 1 OF 1, 1942DP111 SHT 1 OF 2, 1942DP111 SHT 2 OF 2)

Service		RL
Fluid Density	LB/FT ³	1070.033
Design Pressure	PSIG	101.5
Design Temperature (Max)	°F	210
Design Temperature (Min)	°F	18
Test Pressure	PSIG	153
Pipe Size	NPS	2
Schedule		80
Flange Rating	CLASS	150
Corrosion Allowance	MM	1.6
Pipe Material		A 106 Gr B
Insulation Type		HC
Insulation Thickness	INCH	25.4

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System-11

Reference Drawing: V-215A-001-A-311 – (1942DP111 SHT 1 OF 2, 1942DP111 SHT 2 OF 2)

Service		LG
Fluid Density	KG/M ³	1063.626
Design Pressure	PSIG	50
Design Temperature (Max)	°F	446
Design Temperature (Min)	°F	18
Test Pressure	PSIG	75
Pipe Size	NPS	3
Schedule		40
Flange Rating	CLASS	300/150
Corrosion Allowance	MM	1.6
Pipe Material		A 106 Gr B
Insulation Type		PP
Insulation Thickness	MM	25.4

System-13

Reference Drawing: V-215A-001-A-311 – (1942DP101 SHT 1 OF 2, 1942DP101 SHT 2 OF 1)

Service		RG
Fluid Density	KG/M ³	659.960
Design Pressure	PSIG	600
Design Temperature (Max)	°F	446
Design Temperature (Min)	°F	18
Test Pressure	PSIG	900
Pipe Size	NPS	3
Schedule		40
Flange Rating	CLASS	300/600
Corrosion Allowance	MM	1.6
Pipe Material		A 106 Gr B
Insulation Type		N/A
Insulation Thickness	MM	N/A

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System-14

Reference Drawing: V-215A-001-A-311 – (1942DP115 SHT 1 OF 1)

Service		FG
Fluid Density	KG/M ³	1.021
Design Pressure	PSIG	101.5
Design Temperature (Max)	°F	446
Design Temperature (Min)	°F	18
Test Pressure	PSIG	153
Pipe Size	NPS	2
Schedule		80
Flange Rating	CLASS	150
Corrosion Allowance	MM	1.6
Pipe Material		A 106 Gr B
Insulation Type		HC
Insulation Thickness	MM	1

System-15

Reference Drawing: V-215A-001-A-311 – (1942DP110 SHT 1 OF 1)

Service		LG
Fluid Density	KG/M ³	1034.793
Design Pressure	PSIG	50
Design Temperature (Max)	°F	446
Design Temperature (Min)	°F	18
Test Pressure	PSIG	75
Pipe Size	NPS	4
Schedule		40
Flange Rating	CLASS	150/600
Corrosion Allowance	MM	1.6
Pipe Material		A 106 Gr B
Insulation Type		HC
Insulation Thickness	MM	25.4

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System-16

Reference Drawing: V-215A-001-A-311 – (1942DP109 SHT 1 OF 1)

Service		LG
Fluid Density	KG/M ³	1042.962
Design Pressure	PSIG	101.5
Design Temperature (Max)	°F	446
Design Temperature (Min)	°F	18
Test Pressure	PSIG	153
Pipe Size	NPS	4
Schedule		40
Flange Rating	CLASS	150/600
Corrosion Allowance	MM	1.6
Pipe Material		A 106 Gr B
Insulation Type		HC
Insulation Thickness	MM	25.4

4. DESIGN DETAILS

Piping is designed to satisfy the requirements of ASME B 31.3 in respect of the allowable stresses as mentioned below:

Displacement Stress Range, $S_A = f (1.25 S_c + 0.25 S_h)$

Expansion Stress Range, $S_E \leq S_A + f (S_h - S_L)$

Longitudinal Stress, $S_L = S_h$

S_A = Allowable displacement stress range

S_E = Allowable expansion stress range

S_L = Allowable sum of longitudinal stress due to pressure, weight and other sustained loads

S_c = Basic allowable stress at minimum metal temperature

S_h = Basic allowable stress at maximum metal temperature

f = Stress range reduction factor

5. STRESS ANALYSIS

5.1 General

The stress analysis has been performed using Caesar II piping analysis software.

Caesar II is windows based PC package for piping design and stress analysis. The Programme is developed by COADE, USA.

Finite element models are developed based on the isometric drawing included in attachment. Piping model is constructed in Caesar II as per the pipe routing, pipe elevation and support arrangement depicted in the drawing.

The input generation of the model consists of describing the piping elements, as well as any external influences (boundary conditions or loads) acting on those elements. Each pipe element is identified by two node numbers, and requires the specification of geometric, cross sectional and material data.

The restraint types used in the analysis are identified below:

X: restraint that prevents lateral/ axial movement.

Y: restraint that prevents vertical movement.

Z: restraint that prevents axial/ lateral movement.

GUIDE: restraint that prevents lateral and vertical movement.

Anchor: restraint that prevents movements on all axes.

5.2 Supports

Support points shall be adequately located and spaced for optimum load distribution and weight balance.

Supports shall be properly located with necessary access for periodic inspection of piping/Welding.

5.3 Coordinate System

Caesar II uses a standard orthogonal X, Y, and Z co-ordinate system in order to generate a model space.

Local axes +X, +Y, +Z represent directions towards South, Vertically upwards and West respectively.

5.4 Load Cases

The load components that are relevant to this analysis are listed below:

Caesar Load Case Number	Caesar Load Combination	Stress Case %
1	W+P1+T1	OPE
2	W+P1+T2	OPE
3	W+P1	SUS
4	L1-L3	EXP
5	L2-L3	EXP
6	WW+HP	HYD

Legends

W= Weight

OPE= Operating stress case

T1= Operating temperature

SUS= Sustained stress case

P1= Operating pressure

EXP= Expansion stress case

WW=Pipe weight filled with water

HYD = Hydro stress case

HP=Hydro test pressure

5.5 Horizontal Seismic Coefficient

Seismic Analysis performed as per standard ASCE 7 – 2005.

$$a_H = F_p/W_p$$

a_H = Calculated Horizontal Acceleration

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$$a_H = [(0.4 \times a_p \times S_{DS}) / (R_p / I_p)] (1 + 2z/h)$$

a_p = Component Amplification Factor from Table 13.6 – 1

= 2.5 for Piping

S_{DS} = Design Elastic Response Acceleration at Short Period (0.2 sec) from Section 11.4.4

R_p = Component Response Modification Factor from Table 13.6 – 1

= 3

I_p = Component Importance Factor from Section 13.1.3

= 1.5

z = Height in Structure at Point of Attachment

h = Average Roof Height of Structure

$$S_{DS} = 2/3 S_{MS}$$

$$S_{MS} = F_a \times S_s$$

F_a = 1.2 for Site Class C

$$S_s = 0.186$$

$$S_{MS} = 1.2 \times 0.186 = 0.2232$$

$$S_{DS} = 2/3 S_{MS} = 2/3 \times 0.2232 = 0.1488$$

$$a_H = [(0.4 \times 2.5 \times 0.1488) / (3/1.5)] (1 + (2 \times 1)) = 0.2232$$

5.6 Wind Analysis

Wind Analysis performed as per standard ASCE 7 – 2005.

Wind Shape Factor = 0.65

Wind Speed = 155 km/hr

6. EVALUATION OF THE RESULTS

6.1 Stress Analysis

It is confirmed from the results that the maximum intensity of stress induced in any piping component /element, is well within the allowable limits of the Design Code (B 31.3).

6.2 Summary of Results

6.2.1 Summary of Stresses

System-1&2

Stress Case	Caesar Load Combination	Code Stress%
Sustained	W+P1	36.6
Expansion	L2-L6	17.2
Expansion	L4-L6	6.9
Hydro	WW+HP	22.4

System-3

Stress Case	Caesar Load Combination	Code Stress%
Sustained	W+P1	52.5
Expansion	L2-L4	16.3
Expansion	L3-L4	5.9
Hydro	WW+HP	20.1

System-4

Stress Case	Caesar Load Combination	Code Stress%
Sustained	W+P1	35.4
Expansion	L2-L4	72.8
Expansion	L3-L4	41.8
Hydro	WW+HP	12.4

System-5

Stress Case	Caesar Load Combination	Code Stress%
Sustained	W+P1	47.8
Expansion	L4-L6	10.7
Expansion	L5-L6	4.1
Hydro	WW+HP	17.0

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System-6

Stress Case	Caesar Load Combination	Code Stress%
Sustained	W+P1	21.5
Expansion	L2-L4	6.6
Expansion	L3-L4	0.0
Hydro	WW+HP	9.1

System-7

Stress Case	Caesar Load Combination	Code Stress%
Sustained	W+P1	15.1
Expansion	L2-L4	33.4
Expansion	L3-L4	0.0
Hydro	WW+HP	7.7

System-8

Stress Case	Caesar Load Combination	Code Stress%
Sustained	W+P1	9.2
Expansion	L2-L4	20.4
Expansion	L3-L4	4.2
Hydro	WW+HP	4.5

System-9

Stress Case	Caesar Load Combination	Code Stress%
Sustained	W+P1	26.5
Expansion	L2-L4	16.8
Expansion	L3-L4	5.9
Hydro	WW+HP	15.7

System-10

Stress Case	Caesar Load Combination	Code Stress%
Sustained	W+P1	30.5
Expansion	L2-L4	72.7
Expansion	L3-L4	24.9
Hydro	WW+HP	13.4

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System-11

Stress Case	Caesar Load Combination	Code Stress%
Sustained	W+P1	22.7
Expansion	L2-L4	40.4
Expansion	L3-L4	20.4
Hydro	WW+HP	11.9

System-13

Stress Case	Caesar Load Combination	Code Stress%
Sustained	W+P1	26.6
Expansion	L2-L4	10.1
Expansion	L3-L4	5.2
Hydro	WW+HP	13.5

System-14

Stress Case	Caesar Load Combination	Code Stress%
Sustained	W+P1	13.7
Expansion	L2-L4	7.0
Expansion	L3-L4	0.8
Hydro	WW+HP	6.4

System-15

Stress Case	Caesar Load Combination	Code Stress%
Sustained	W+P1	6.2
Expansion	L2-L4	7.7
Expansion	L3-L4	0.6
Hydro	WW+HP	2.6

System-16

Stress Case	Caesar Load Combination	Code Stress%
Sustained	W+P1	17.0
Expansion	L2-L4	8.3
Expansion	L3-L4	3.2
Hydro	WW+HP	7.1

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6.2.2 Nozzle Load Details

System-1&2

Node No	Equipment Tag No./Nozzle No.	Allowable Load (N & N-m)						Actual Load (N & N-m)					
		P	V _L	V _C	M _T	M _L	M _C	FX	FY	FZ	MX	MY	MZ
50	C0001/N2	99000	99000	99000	46500	46500	46500	-14405	41563	16610	26808	-7445	25337

System-3

Node No	Equipment Tag No./Nozzle No.	Allowable Load (N & N-m)						Actual Load (N & N-m)					
		P	V _L	V _C	M _T	M _L	M _C	FX	FY	FZ	MX	MY	MZ
50	G0009A/D	255	255	255	115	115	115	101	-227	20	65	-53	-42
1150	G0009B/D	255	255	255	115	115	115	-100	-238	-37	-43	41	65
3900	D0024/N4	2260	2260	2260	1060	1060	1060	-165	366	-196	80	-75	186
6600	E0006/N1	2260	2260	2260	520	520	520	305	-2186	-206	639	148	-518
9200	E0004/S1	2260	2260	2260	1060	1060	1060	-301	-1534	265	371	97	-526
12000	C0001/N4	2260	2260	2260	1060	1060	1060	113	-603	139	108	59	234
15750	D0024/N9	2260	2260	2260	1060	1060	1060	-144	-746	-1044	-508	161	-106

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System-4

Node No	Equipment Tag No./Nozzle No.	Allowable Load (N & N-m)						Actual Load (N & N-m)					
		P	V _L	V _C	M _T	M _L	M _C	FX	FY	FZ	MX	MY	MZ
50	C-0001/N5	6100	22344	6100	2900	2900	7478	3451	-22344	3725	-2122	-1505	7478

System-5

Node No	Equipment Tag No./Nozzle No.	Allowable Load (N & N-m)						Actual Load (N & N-m)					
		P	V _L	V _C	M _T	M _L	M _C	FX	FY	FZ	MX	MY	MZ
50	E0007/S4	480	480	480	360	360	360	115	-431	8	-9	-4	-171
2350	C0002/N3	2260	2260	2260	520	520	520	-182	-1153	210	-212	-81	-516

System-6

Node No	Equipment Tag No./Nozzle No.	Allowable Load (N & N-m)						Actual Load (N & N-m)					
		P	V _L	V _C	M _T	M _L	M _C	FX	FY	FZ	MX	MY	MZ
50	C-0003/N2	3980	3980	3980	1870	1870	1870	-306	-506	113	-17	-67	-316
400	E-0007/S1	480	480	480	360	360	360	221	-309	-28	-9	-2	45

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System-7

Node No	Equipment Tag No./Nozzle No.	Allowable Load (N & N-m)						Actual Load (N & N-m)					
		P	V _L	V _C	M _T	M _L	M _C	FX	FY	FZ	MX	MY	MZ
50	C-0003/N3	6100	6100	6100	2988	2900	2900	139	-716	139	-2988	-80	-1521
300	E-0005/N7	6100	6100	6100	2969	2900	2900	-17	77	-17	2355	58	1508

System-8

Node No	Equipment Tag No./Nozzle No.	Allowable Load (N & N-m)						Actual Load (N & N-m)					
		P	V _L	V _C	M _T	M _L	M _C	FX	FY	FZ	MX	MY	MZ
50	D-0024/N5	2260	2260	2260	1060	1060	1060	337	-1291	391	600	325	96
400	E-0005/N3	2260	2260	2260	1060	1060	1060	-146	811	253	-107	189	-665

System-9

Node No	Equipment Tag No./Nozzle No.	Allowable Load (N & N-m)						Actual Load (N & N-m)					
		P	V _L	V _C	M _T	M _L	M _C	FX	FY	FZ	MX	MY	MZ
10	D-0021/N8	2260	2260	2260	1060	1060	1060	-458	-1822	-1155	-341	952	-678

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System-10

Node No	Equipment Tag No./Nozzle No.	Allowable Load (N & N-m)						Actual Load (N & N-m)					
		P	V _L	V _C	M _T	M _L	M _C	FX	FY	FZ	MX	MY	MZ
50	D0021/N2	2260	2260	2260	1060	1060	1060	-131	-161	201	90	123	99
1450	D0023A/N1	2260	2260	2260	1060	1060	1060	475	-1859	-350	88	106	114
1900	D0023A/N1	2260	2260	2260	1060	1060	1060	-335	-1730	-403	-112	-60	72
7300	D0024/N6	2260	2260	2260	1060	1060	1060	-1772	-680	-995	-174	532	-10
11800	D0023A/N2	2260	2260	2260	1060	1060	1060	107	-316	1762	82	527	-64
11950	D0023B/N2	2260	2260	2260	1060	1060	1060	162	-755	-278	-155	-226	232
13150	D0022/N1	2260	2260	2260	1060	1060	1060	253	-2259	538	-314	-95	497

System-11

Node No	Equipment Tag No./Nozzle No.	Allowable Load (N & N-m)						Actual Load (N & N-m)					
		P	V _L	V _C	M _T	M _L	M _C	FX	FY	FZ	MX	MY	MZ
50	D-0024/N2	3980	3980	3980	1870	1870	1870	-2679	-389	-3389	135	708	-104
1350	G0009A/SUC	295	295	295	145	145	145	-41	-75	-54	61	-12	23
2100	G0009B/SUC	295	295	295	145	145	145	-157	-134	-291	22	-51	24

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System-13

Node No	Equipment Tag No./Nozzle No.	Allowable Load (N & N-m)						Actual Load (N & N-m)					
		P	V _L	V _C	M _T	M _L	M _C	FX	FY	FZ	MX	MY	MZ
50	E-0006/N2	2260	2260	2260	520	520	520	136	-1660	40	-171	46	-186
2050	E0008/N3	3363	3363	3363	1368	1368	1368	-250	-814	345	390	-156	-241

System-14

Node No	Equipment Tag No./Nozzle No.	Allowable Load (N & N-m)						Actual Load (N & N-m)					
		P	V _L	V _C	M _T	M _L	M _C	FX	FY	FZ	MX	MY	MZ
50	E-0005/N4	2260	2260	2260	1060	1060	1060	132	-246	-262	-42	-186	102
500	C0003/N4	2260	2260	2260	1060	1060	1060	-104	-509	250	150	50	215

System-15

Node No	Equipment Tag No./Nozzle No.	Allowable Load (N & N-m)						Actual Load (N & N-m)					
		P	V _L	V _C	M _T	M _L	M _C	FX	FY	FZ	MX	MY	MZ
50	E-0008/N2	1913	1913	1913	440	440	440	198	-1323	1545	-199	89	110
550	D0024/N1	3980	3980	3980	1870	1870	1870	-290	711	-1518	331	82	78

TEG DEHYDRATION PACKAGE

Piping Analysis Report

System-16

Node No	Equipment Tag No./Nozzle No.	Allowable Load (N & N-m)						Actual Load (N & N-m)					
		P	V _L	V _C	M _T	M _L	M _C	FX	FY	FZ	MX	MY	MZ
50	E0007/S2	480	480	480	360	360	360	125	-288	95	-26	-44	-131
550	E0008/N1	1913	1913	1913	440	440	440	-438	-472	-125	223	-181	-320

6.2.3 Tie In Point Load Details

System-1&2 – TP X52

Node No.	Load (N & N-m)						Displacement (mm)		
	FX	FY	FZ	MX	MY	MZ	DX	DY	DZ
1500	3973	-9758	10955	0	0	0	0	0.467	0

6.2.4 Spring Support Details

System-5

ISOMETRIC DRAWING NO.	QTY	SPRING TYPE	FIG. NO.	ASME CODE	VERTICAL MOVEMENT (mm)	HOT LOAD (N)	THEORETICAL INSTALLED LOAD (N)	ACTUAL INSTALLED LOAD (N)	SPRING RATE (N/mm)	HORIZONTAL MOVEMENT (mm)	INSTALLATION HEIGHT (NOTE 1&2) (mm)	REMARKS
NODE												
TAG NO.												
1942DP107	1	VARIABLE SPRING HANGER – STOOL TYPE	82 ANVIL SIZE 3	B31.3	6.799	761	845	0	12.3	5.925	500	LOAD VARIATION = 11%
550												
SP-001												

NOTES:

1. Installation height mentioned is for reference only.
2. Installation height to be decided as per site requirements and shall be informed to vendor.

Attachments

Attachment 1 – CAESAR Documents for SYSTEM 1& 2

Attachment 2 – CAESAR Documents for SYSTEM 3

Attachment 3 – CAESAR Documents for SYSTEM 4

Attachment 4 – CAESAR Documents for SYSTEM 5

Attachment 5 – CAESAR Documents for SYSTEM 6

Attachment 6 – CAESAR Documents for SYSTEM 7

Attachment 7 – CAESAR Documents for SYSTEM 8

Attachment 8 – CAESAR Documents for SYSTEM 9

Attachment 9 – CAESAR Documents for SYSTEM 10

Attachment 10 – CAESAR Documents for SYSTEM 11

Attachment 11 – CAESAR Documents for SYSTEM 13

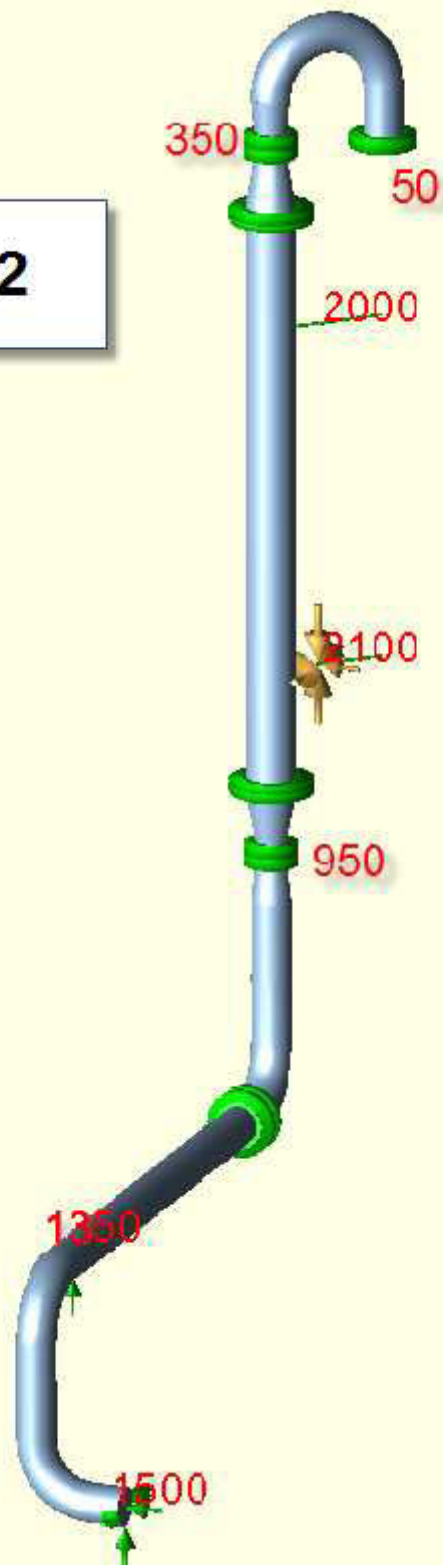
Attachment 12 – CAESAR Documents for SYSTEM 14

Attachment 14 – CAESAR Documents for SYSTEM 15

Attachment 15 – CAESAR Documents for SYSTEM 16



SYSTEM 1&2



CAESAR II 2014 Ver.7.00.00.2800, (Build 140416) Date: AUG 9, 2016 Time: 17:16
 Job:: SYSTEM 1-2_CCI
 Licensed To:: SPLM: INVICTUS ENGINEERING

PROJECT: TEG DEHYDRATION PACKAGE (SYSTEM 1&2)

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Displacements : 21 (OPE) W+D1+T1+P1+U2+F1	88
Displacements : 22 (OPE) W+D1+T1+P1-U2+F1	89
Displacements : 23 (OPE) W+T2+P1+U1	90
Displacements : 24 (OPE) W+T2+P1-U1	91
Displacements : 25 (OPE) W+T2+P1+U2	92
Displacements : 26 (OPE) W+T2+P1-U2	93
Displacements : 27 (OPE) W+T2+P1+U1+F1	94
Displacements : 28 (OPE) W+T2+P1-U1+F1	95
Displacements : 29 (OPE) W+T2+P1+U2+F1	96
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LISTING OF STATIC LOAD CASES FOR THIS ANALYSIS

1 (HYD) WW+HP
2 (OPE) W+D1+T1+P1
3 (OPE) W+D1+T1+P1+F1
4 (OPE) W+T2+P1
5 (OPE) W+T2+P1+F1
6 (SUS) W+P1
7 (OPE) W+D1+T1+P1+WIN1
8 (OPE) W+D1+T1+P1+WIN2
9 (OPE) W+D1+T1+P1+F1+WIN1
10 (OPE) W+D1+T1+P1+F1+WIN2
11 (OPE) W+T2+P1+WIN1
12 (OPE) W+T2+P1+WIN2
13 (OPE) W+T2+P1+F1+WIN1
14 (OPE) W+T2+P1+F1+WIN2
15 (OPE) W+D1+T1+P1+U1
16 (OPE) W+D1+T1+P1-U1
17 (OPE) W+D1+T1+P1+U2
18 (OPE) W+D1+T1+P1-U2
19 (OPE) W+D1+T1+P1+U1+F1
20 (OPE) W+D1+T1+P1-U1+F1
21 (OPE) W+D1+T1+P1+U2+F1
22 (OPE) W+D1+T1+P1-U2+F1
23 (OPE) W+T2+P1+U1
24 (OPE) W+T2+P1-U1
25 (OPE) W+T2+P1+U2
26 (OPE) W+T2+P1-U2
27 (OPE) W+T2+P1+U1+F1
28 (OPE) W+T2+P1-U1+F1
29 (OPE) W+T2+P1+U2+F1
30 (OPE) W+T2+P1-U2+F1
31 (OCC) L31=L7-L2
32 (OCC) L32=L8-L2
33 (OCC) L33=L9-L3
34 (OCC) L34=L10-L3
35 (OCC) L35=L11-L4
36 (OCC) L36=L12-L4
37 (OCC) L37=L13-L5
38 (OCC) L38=L14-L5
39 (OCC) L39=L15-L2
40 (OCC) L40=L16-L2
41 (OCC) L41=L17-L2
42 (OCC) L42=L18-L2
43 (OCC) L43=L19-L3
44 (OCC) L44=L20-L3
45 (OCC) L45=L21-L3
46 (OCC) L46=L22-L3
47 (OCC) L47=L23-L4
48 (OCC) L48=L24-L4
49 (OCC) L49=L25-L4
50 (OCC) L50=L26-L4

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PROJECT: TEG DEHYDRATION PACKAGE (SYSTEM 1&2)

51 (OCC) L51=L27-L5
52 (OCC) L52=L28-L5
53 (OCC) L53=L29-L5
54 (OCC) L54=L30-L5
55 (OCC) L55=L31+L6
56 (OCC) L56=L32+L6
57 (OCC) L57=L33+L6
58 (OCC) L58=L34+L6
59 (OCC) L59=L35+L6
60 (OCC) L60=L36+L6
61 (OCC) L61=L37+L6
62 (OCC) L62=L38+L6
63 (OCC) L63=L39+L6
64 (OCC) L64=L40+L6
65 (OCC) L65=L41+L6
66 (OCC) L66=L42+L6
67 (OCC) L67=L43+L6
68 (OCC) L68=L44+L6
69 (OCC) L69=L45+L6
70 (OCC) L70=L46+L6
71 (OCC) L71=L47+L6
72 (OCC) L72=L48+L6
73 (OCC) L73=L49+L6
74 (OCC) L74=L50+L6
75 (OCC) L75=L51+L6
76 (OCC) L76=L52+L6
77 (OCC) L77=L53+L6
78 (OCC) L78=L54+L6
79 (EXP) L79=L2-L6
80 (EXP) L80=L4-L6