Project Name : Binak compressor station
Item Name : Sluge Pump 2101
Prepared by : M.Aryafar

PUMP CALCULATION

OPERATING DATA

Temperature (°C)	15.2
Density @ Op. (Kg/m3)	716
Vapor pressure @ Op.(Bar a)	6.500
Viscosity @ Op. (cP)	0.58
Normal capacity (m3/hr)	10.0
Dedign Factor %	10%
Design capacity (m3/hr)	11.0

SUCTION PRESSURE CALCULATION AT Qd

		Bar g	m
Min. liquid level in drum	1>>>>>		0.50
Max. liquid level in drum	2>>>>>		3.38
Bottom of drum Distanc from pump center line	3>>>>>		1.20
Total suction pressure drop in line & fittings	4>>>>>	-0.072	-1.03
Drum operating pressure	5>>>>>	5.5	78.4
Min suction liquid pressure	1+3+4+5=6>>>>>	5.55	79.0

		Bar a	m
Absolute pressure	7>>>>>	1.013	-
Vapor pressure @ Op.	8>>>>>	6.50	-
Available NPSH	6-8+7=9>>>>>	0.06	0.9
Max required NPSH (by vendor)			

DISCHARGE PRESSURE CALCULATION AT Qd

		Bar g	m
Outlet pressure at injection point	10>>>>>	17.0	
Static head above pump axis	11>>>>>	0.0	0.0
Total discharge pressure drop in equipment	12>>>>>	0.0	
Total discharge pressure drop in line & fittings	13>>>>>	-1.78	
Calculated discharge pressure	10+11+12-13=14>>>>>	18.8	
Total discharge pressure	16+6>>>>>	19.55	

DIFFERENTIAL PRESSURE CALCULATION

		Bar	m
Differential pressure (at Qn)	14-6=15>>>>>	13.23	188.5
Estimated differential pressure (at Qn)	16≥15	14.0	199.5

DESIGN PRESSURE ESTIMATION

		Bar g	m
Maximum suction pressure	17>>>>>	5.75	82
20% of differential pressure at Qd	1.2X16=18>>>>>	16.8	
Pump design pressure (shut off pressure)	17+18=19>>>>>	22.5	

POWER CONSUMPTION ESTIMATION AT QD

Pump efficiency (Ep)	61%
Estimated hydraulic power @ Qd (KW)	4.3
Brake power (BHP) (hydraulic power/Ep)	7.0
Estimated efficiency of electro motor (EM)	-
Absorbed power (KW)	-

PRESSURE DROP CALCULATION

SUCTION PRESSURE DROP

Design capacity (m3/hr)	11.0	
Viscosity @ Op. (cP)	0.58	
Density @ Op. (Kg/m3)	715.8	
E (m)	0.000046	
Pipe size (in)	4.0	
SCH	STD	
Thk (in)	0.24	
ID (m)	0.10	
Velosity (m/s)	0.37	
Re	47232.1	
Friction factor (f)	0.02	
Pressure drop (bar/100m)	0.01097	
Acceptable Pressure Drop (bar/100m)- Base on design criteria	0.35	**OK**
Acceptable Velosity (m/s)- Base on design criteria	0.90	**OK**
E/D	0.00045	
a	6.64785	
b	6.64688	
a-b	0.00098	

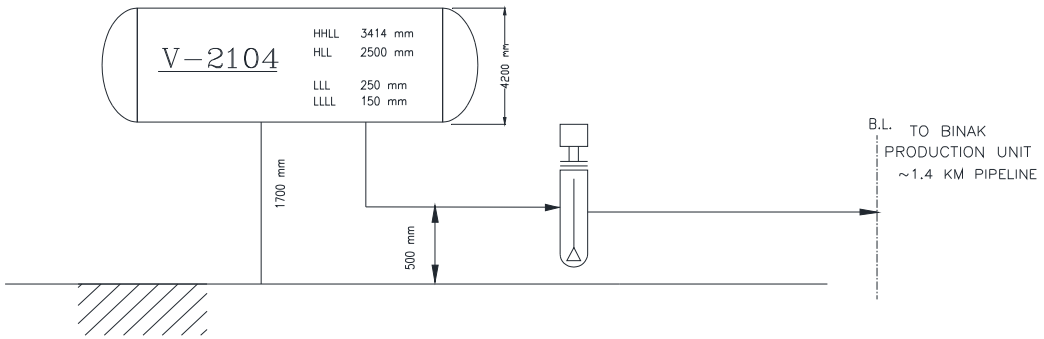
	L/D	No.	
Ball/Gate Valve Fully Open Conventional	13	2	2.6
Check Valve Fully Open	135	0	0.0
Tee with Flow Through branch	20	3	6.1
Elbow 90 Long Radius	13	4	5.3
Line lenght	-	20	4
Static Head		M	0.0
Total Equi. Length (m)			18.0
			Bar
Strainer		1	0.07
Total Equi. Length (Bar)			-0.002
Total Pressure Drop (Bar)			-0.072

DISCHARG LINE PRESSURE DROP

Design capacity (m3/hr)				11.0	
Viscosity @ Op. (cP)				0.58	
Density @ Op. (Kg/m3)				715.8	
E (m)				0.000046	
Pipe size (in)				3.0	
SCH				40.0	
Thk (in)				0.22	
ID (m)				0.08	
Velosity (m/s)				0.64	
Re				61980.6	
Friction factor (f)				0.02208	
Pressure drop (bar/100m)				0.04166	
Acceptable Pressure Drop (bar/100m)- Base on design criteria				0.45	**OK**
Acceptable Velosity (m/s)- Base on design criteria				1.50	**OK**
E/D				0.00059	
a				6.72986	
b				6.72888	
a-b				0.00098	

	L/D	No.		
Ball/Gate Valve Fully Open Conventional	13	5		5.0
Check Valve Fully Open	135	1		10.3
Tee with Flow Through branch	60	3		13.7
Elbow 90 Long Radius	20	4		6.1
Line lenght	-	-		40
Static Head		M		
Control Valve		1	-1.50	
Orifice	1		-0.25	
Total Equi. Length (m)				75.1
Total Equi. Length (Bar)				-0.031
Total Pressure Drop (Bar)				-1.78

NOTES:


V-2104
HHLL 3414 mm
HLL 2500 mm
LLL 250 mm
LLLL 150 mm
4200 mm
1700 mm
500 mm
B.L.
TO BINAK
PRODUCTION UNIT
~1.4 KM PIPELINE

P-2101A/B

Data shown below: ANSI / ASME B36.10M-1996 (CS), ANSI / ASME B3

Nominal Size (incl	Nominal Size (mm)	10	20	30	40	60
0.125	3.13	N/A	N/A	N/A	0.269	N/A
0.25	6.25	N/A	N/A	N/A	0.364	N/A
0.375	9.39	N/A	N/A	N/A	0.493	N/A
0.5	12.5	N/A	N/A	N/A	0.622	N/A
0.75	18.75	N/A	N/A	N/A	0.824	N/A
1	25	N/A	N/A	N/A	1.049	N/A
1.25	31.75	N/A	N/A	N/A	1.380	N/A
1.5	37.5	N/A	N/A	N/A	1.610	N/A
2	50	N/A	N/A	N/A	2.067	N/A
2.5	62.5	N/A	N/A	N/A	2.469	N/A
3	75	N/A	N/A	N/A	3.068	N/A
3.5	87.5	N/A	N/A	N/A	3.548	N/A
4	100	N/A	N/A	N/A	4.026	N/A
5	125	N/A	N/A	N/A	5.047	N/A
6	150	N/A	N/A	N/A	6.065	N/A
8	200	N/A	8.125	8.071	7.981	7.813
10	250	N/A	10.250	10.136	10.020	9.750
12	300	N/A	12.250	12.090	11.938	11.626
14	350	13.500	13.376	13.250	13.124	12.812
16	400	15.500	15.376	15.250	15.000	14.688
18	450	17.500	17.376	17.124	16.876	16.500
20	500	19.500	19.250	19.000	18.812	18.376
22	550	21.500	21.250	21.000	N/A	20.250
24	600	23.500	23.250	22.876	22.624	22.062
26	650	25.376	25.000	N/A	N/A	N/A
28	700	27.376	27.000	26.750	N/A	N/A
30	750	29.376	29.000	28.750	N/A	N/A
32	800	31.376	31.000	30.750	30.624	N/A
34	850	33.312	33.000	32.750	32.624	N/A
36	900	35.376	35.000	34.750	34.500	N/A
38	950	N/A	N/A	N/A	N/A	N/A
40	1000	N/A	N/A	N/A	N/A	N/A
42	1050	N/A	N/A	N/A	N/A	N/A
44	1100	N/A	N/A	N/A	N/A	N/A
46	1150	N/A	N/A	N/A	N/A	N/A
48	1200	N/A	N/A	N/A	N/A	N/A
52	1300	N/A	N/A	N/A	N/A	N/A

Nominal Size (incl	Nominal Size (mm)	10	20	30	40	60
0.125	3.13	N/A	N/A	N/A	0.068	N/A
0.25	6.25	N/A	N/A	N/A	0.088	N/A
0.375	9.39	N/A	N/A	N/A	0.091	N/A
0.5	12.5	N/A	N/A	N/A	0.109	N/A
0.75	18.75	N/A	N/A	N/A	0.113	N/A
1	25	N/A	N/A	N/A	0.133	N/A
1.25	31.75	N/A	N/A	N/A	0.140	N/A
1.5	37.5	N/A	N/A	N/A	0.145	N/A
2	50	N/A	N/A	N/A	0.154	N/A
2.5	62.5	N/A	N/A	N/A	0.203	N/A
3	75	N/A	N/A	N/A	0.216	N/A
3.5	87.5	N/A	N/A	N/A	0.226	N/A

4	**100**	N/A	N/A	N/A	0.237	N/A
5	**125**	N/A	N/A	N/A	0.258	N/A
6	**150**	N/A	N/A	N/A	0.280	N/A
8	**200**	N/A	0.250	0.277	0.322	0.406
10	**250**	N/A	0.250	0.307	0.365	0.500
12	**300**	N/A	0.250	0.330	0.406	0.562
14	**350**	0.250	0.312	0.375	0.438	0.594
16	**400**	0.250	0.312	0.375	0.500	0.656
18	**450**	0.250	0.312	0.438	0.562	0.750
20	**500**	0.250	0.375	0.500	0.594	0.812
22	**550**	0.250	0.375	0.500	N/A	0.875
24	**600**	0.250	0.375	0.562	0.688	0.969
26	**650**	0.312	0.500	N/A	N/A	N/A
28	**700**	0.312	0.500	0.625	N/A	N/A
30	**750**	0.312	0.500	0.625	N/A	N/A
32	**800**	0.312	0.500	0.625	0.688	N/A
34	**850**	0.344	0.500	0.625	0.688	N/A
36	**900**	0.312	0.500	0.625	0.750	N/A
38	**950**	N/A	N/A	N/A	N/A	N/A
40	**1000**	N/A	N/A	N/A	N/A	N/A
42	**1050**	N/A	N/A	N/A	N/A	N/A
44	**1100**	N/A	N/A	N/A	N/A	N/A
46	**1150**	N/A	N/A	N/A	N/A	N/A
48	**1200**	N/A	N/A	N/A	N/A	N/A
52	**1300**	N/A	N/A	N/A	N/A	N/A

6.19M-1985 (SS)

Schedule versus Pipe ID (inches)

CARBON STEEL							
80	100	120	140	160	STD	XS	XXS
0.215	N/A	N/A	N/A	N/A	0.269	0.215	N/A
0.302	N/A	N/A	N/A	N/A	0.364	0.302	N/A
0.423	N/A	N/A	N/A	N/A	0.493	0.423	N/A
0.546	N/A	N/A	N/A	0.466	0.622	0.546	0.252
0.742	N/A	N/A	N/A	0.612	0.824	0.742	0.434
0.957	N/A	N/A	N/A	0.815	1.049	0.957	0.599
1.278	N/A	N/A	N/A	1.160	1.380	1.278	0.896
1.500	N/A	N/A	N/A	1.338	1.610	1.500	1.100
1.939	N/A	N/A	N/A	1.687	2.067	1.939	1.503
2.323	N/A	N/A	N/A	2.125	2.469	2.323	1.771
2.900	N/A	N/A	N/A	2.624	3.068	2.900	2.300
3.364	N/A	N/A	N/A	N/A	3.548	3.364	N/A
3.826	N/A	3.624	N/A	3.438	4.026	3.826	3.152
4.813	N/A	4.563	N/A	4.313	5.047	4.813	4.063
5.761	N/A	5.501	N/A	5.187	6.065	5.761	4.897
7.625	7.437	7.187	7.001	6.813	7.981	7.625	6.875
9.562	9.312	9.062	8.750	8.500	10.020	9.750	8.750
11.374	11.062	10.750	10.500	10.126	12.000	11.750	10.750
12.500	12.124	11.812	11.500	11.188	13.250	13.000	N/A
14.312	13.938	13.562	13.124	12.812	15.250	15.000	N/A
16.124	15.688	15.250	14.876	14.438	17.250	17.000	N/A
17.938	17.438	17.000	16.500	16.062	19.250	19.000	N/A
19.750	19.250	18.750	18.250	17.750	21.250	21.000	N/A
21.562	20.938	20.376	19.876	19.312	23.250	23.000	N/A
N/A	N/A	N/A	N/A	N/A	25.250	25.000	N/A
N/A	N/A	N/A	N/A	N/A	27.250	27.000	N/A
N/A	N/A	N/A	N/A	N/A	29.250	29.000	N/A
N/A	N/A	N/A	N/A	N/A	31.250	31.000	N/A
N/A	N/A	N/A	N/A	N/A	33.250	33.000	N/A
N/A	N/A	N/A	N/A	N/A	35.250	35.000	N/A
N/A	N/A	N/A	N/A	N/A	37.250	37.000	N/A
N/A	N/A	N/A	N/A	N/A	39.250	39.000	N/A
N/A	N/A	N/A	N/A	N/A	41.250	41.000	N/A
N/A	N/A	N/A	N/A	N/A	43.250	43.000	N/A
N/A	N/A	N/A	N/A	N/A	45.250	45.000	N/A
N/A	N/A	N/A	N/A	N/A	47.250	47.000	N/A
N/A	N/A	N/A	N/A	N/A	51.250	51.000	N/A

Schedule versus Wall Thickness (inches)

CARBON STEEL							
80	100	120	140	160	STD	XS	XXS
0.095	N/A	N/A	N/A	N/A	0.068	0.095	N/A
0.119	N/A	N/A	N/A	N/A	0.088	0.119	N/A
0.126	N/A	N/A	N/A	N/A	0.091	0.126	N/A
0.147	N/A	N/A	N/A	0.187	0.109	0.147	0.294
0.154	N/A	N/A	N/A	0.219	0.113	0.154	0.308
0.179	N/A	N/A	N/A	0.250	0.133	0.179	0.358
0.191	N/A	N/A	N/A	0.250	0.140	0.191	0.382
0.200	N/A	N/A	N/A	0.281	0.145	0.200	0.400
0.218	N/A	N/A	N/A	0.344	0.154	0.218	0.436
0.276	N/A	N/A	N/A	0.375	0.203	0.276	0.552
0.300	N/A	N/A	N/A	0.438	0.216	0.300	0.600
0.318	N/A	N/A	N/A	N/A	0.226	0.318	N/A

0.337	N/A	0.438	N/A	0.531	0.237	0.337	0.674
0.375	N/A	0.500	N/A	0.625	0.258	0.375	0.750
0.432	N/A	0.562	N/A	0.719	0.280	0.432	0.864
0.500	0.594	0.719	0.812	0.906	0.322	0.500	0.875
0.594	0.719	0.844	1.000	1.125	0.365	0.500	1.000
0.688	0.844	1.000	1.125	1.312	0.375	0.500	1.000
0.750	0.938	1.094	1.250	1.406	0.375	0.500	N/A
0.844	1.031	1.219	1.438	1.594	0.375	0.500	N/A
0.938	1.156	1.375	1.562	1.781	0.375	0.500	N/A
1.031	1.281	1.500	1.750	1.969	0.375	0.500	N/A
1.125	1.375	1.625	1.875	2.125	0.375	0.500	N/A
1.219	1.531	1.812	2.062	2.344	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A

STAINLESS STEEL			
5S	**10S**	**40S**	**80S**
N/A	0.307	0.269	0.215
N/A	0.410	0.364	0.302
N/A	0.545	0.493	0.423
0.710	0.674	0.622	0.546
0.920	0.884	0.824	0.742
1.185	1.094	1.049	0.957
1.530	1.442	1.380	1.278
1.770	1.682	1.610	1.500
2.245	2.157	2.067	1.939
2.709	2.635	2.469	2.323
3.334	3.260	3.068	2.900
3.834	3.760	3.548	3.364
4.334	4.260	4.026	3.826
5.345	5.295	5.047	4.813
6.407	6.375	6.065	5.761
8.407	8.329	7.981	7.625
10.482	10.420	10.020	9.750
12.438	12.390	12.000	11.750
13.688	13.624	N/A	N/A
15.670	15.624	N/A	N/A
17.670	17.624	N/A	N/A
19.624	19.564	N/A	N/A
21.624	21.564	N/A	N/A
23.564	23.500	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
29.500	29.376	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

STAINLESS STEEL			
5S	**10S**	**40S**	**80S**
N/A	0.049	0.068	0.095
N/A	0.065	0.088	0.119
N/A	0.065	0.091	0.126
0.065	0.083	0.109	0.147
0.065	0.083	0.113	0.154
0.065	0.109	0.133	0.179
0.065	0.109	0.140	0.191
0.065	0.109	0.145	0.200
0.065	0.109	0.154	0.218
0.083	0.120	0.203	0.276
0.083	0.120	0.216	0.300
0.083	0.120	0.226	0.318

0.083	0.120	0.237	0.337
0.109	0.134	0.258	0.375
0.109	0.134	0.280	0.432
0.109	0.148	0.322	0.500
0.134	0.165	0.365	0.500
0.156	0.180	0.375	0.500
0.156	0.188	N/A	N/A
0.165	0.188	N/A	N/A
0.165	0.188	N/A	N/A
0.188	0.218	N/A	N/A
0.188	0.218	N/A	N/A
0.218	0.250	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
0.250	0.312	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

Project Name : Binak compressor station
Item Name : Glycol Manual Pump P-2102
Prepared by : M.Aryafar

PUMP CALCULATION

OPERATING DATA

Temperature (°C)	30
Density @ Op. (Kg/m3)	1115
Vapor pressure @ Op.(Bar a)	0.000
Viscosity @ Op. (cP)	85.86
Normal capacity (m3/hr)	3.0
Design Factor %	10%
Design capacity (m3/hr)	3.3

SUCTION PRESSURE CALCULATION AT Qd

		Bar g	m
Min. liquid level in Barrel	1>>>>>		0.00
Max. liquid level in Barrel	2>>>>>		1.00
Bottom of Barrel Distance from pump center line	3>>>>>		0.74
Total suction pressure drop in line & fittings	4>>>>>	-0.093	-0.85
Drum operating pressure	5>>>>>	0.00	0.0
Min suction liquid pressure	1+3+4+5=6>>>>>	-0.01	-0.1

		Bar a	m
Absolute pressure	7>>>>>	1.013	-
Vapor pressure @ Op.	8>>>>>	0.00	-
Available NPSH	6-8+7=9>>>>>	1.00	9.2
Max required NPSH (by vendor)			

DISCHARGE PRESSURE CALCULATION AT Qd

		Bar g	m
Outlet pressure at injection point	10>>>>>	0.5	
Static head above pump axis	11>>>>>	0.5	4.3
Total discharge pressure drop in equipment	12>>>>>	0.0	
Total discharge pressure drop in line & fittings	13>>>>>	-0.06	
Calculated discharge pressure	10+11+12-13=14>>>>>	1.04	
Total discharge pressure	16+6>>>>>	1.49	

DIFFERENTIAL PRESSURE CALCULATION

		Bar	m
Differential pressure (at Qn)	14-6=15>>>>>	1.05	9.6
Estimated differential pressure (at Qn)	16≥15	1.5	13.7

DESIGN PRESSURE ESTIMATION

		Bar g	m
Maximum suction pressure	17>>>>>	0.10	1
20% of differential pressure at Qd	1.2X16=18>>>>>	1.8	
Pump design pressure (shut off pressure)	17+18=19>>>>>	1.9	

POWER CONSUMPTION ESTIMATION AT QD

Pump efficiency (Ep)	31%
Estimated hydraulic power @ Qd (KW)	0.1
Brake power (BHP) (hydraulic power/Ep)	0.4
Estimated efficiency of electro motor (EM)	-
Absorbed power (KW)	-

PRESSURE DROP CALCULATION

SUCTION PRESSURE DROP

Design capacity (m3/hr)	3.3	
Viscosity@ Op. (cP)	85.86	
Density @ Op. (Kg/m3)	1115.0	
E (m)	0.000046	
Pipe size (in)	2.0	
SCH	STD	
Thk (in)	0.15	
ID (m)	0.05	
Velocity (m/s)	0.42	
Re	288.8	
Friction factor (f)	0.10	
Pressure drop (bar/100m)	0.19514	
Acceptable Pressure Drop (bar/100m)- Base on design criteria	0.35	**OK**
Acceptable Velosity (m/s)- Base on design criteria	0.90	**OK**
E/D	0.00088	
a	3.12503	
b	3.12471	
a-b	0.00032	

	L/D	No.	
Ball/Gate Valve Fully Open Conventional	13	1	0.7
Check Valve Fully Open	135	0	0.0
Tee with Flow Through branch	20	0	0.0
Elbow 90 Long Radius	13	2	1.3
Line length	-	-	10
Static Head		M	0.0
Total Equi. Length (m)			12.0
			Bar
Strainer		1	0.07
Total Equi. Length (Bar)			-0.023
Total Pressure Drop (Bar)			-0.093

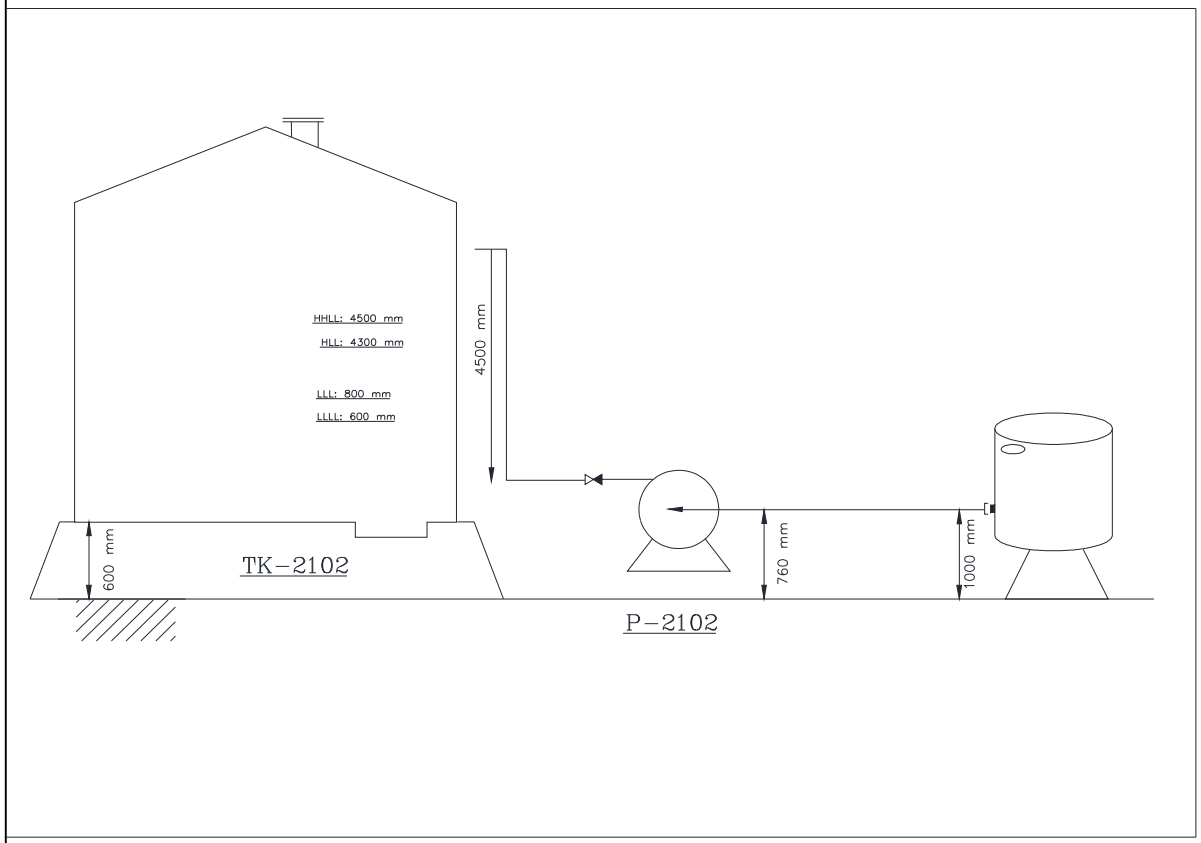
DISCHARG LINE PRESSURE DROP

Design capacity (m3/hr)	3.3	
Viscosity @ Op. (cP)	85.86	
Density @ Op. (Kg/m3)	1115.0	
E (m)	0.000046	
Pipe size (in)	2.0	
SCH	STD	
Thk (in)	0.15	
ID (m)	0.05	
Velocity (m/s)	0.42	
Re	288.8	
Friction factor (f)	0.10240	
Pressure drop (bar/100m)	0.19514	
Acceptable Pressure Drop (bar/100m)- Base on design criteria	0.45	**OK**
Acceptable Velocity (m/s)- Base on design criteria	1.50	**OK**
E/D	0.00088	
a	3.12503	
b	3.12471	
a-b	0.00032	

	L/D	No.	
Ball/Gate Valve Fully Open Conventional	13	1	0.7
Check Valve Fully Open	135	1	6.9
Tee with Flow Through branch	60	1	3.0
Elbow 90 Long Radius	20	2	2.0
Line lenght	-	-	20
Static Head		M	0.0

Total Equi. Length (m)	32.6
Total Equi. Length (Bar)	-0.064
Total Pressure Drop (Bar)	-0.064

NOTES:


HHLL: 4500 mm
HLL: 4300 mm
LLL: 800 mm
LLLL: 600 mm
4500 mm
600 mm
TK-2102
760 mm
1000 mm
P-2102

Data shown below: ANSI / ASME B36.10M-1996 (CS), ANSI / ASME B3

Nominal Size (incl	Nominal Size (mm)	10	20	30	40	60
0.125	3.13	N/A	N/A	N/A	0.269	N/A
0.25	6.25	N/A	N/A	N/A	0.364	N/A
0.375	9.39	N/A	N/A	N/A	0.493	N/A
0.5	12.5	N/A	N/A	N/A	0.622	N/A
0.75	18.75	N/A	N/A	N/A	0.824	N/A
1	25	N/A	N/A	N/A	1.049	N/A
1.25	31.75	N/A	N/A	N/A	1.380	N/A
1.5	37.5	N/A	N/A	N/A	1.610	N/A
2	50	N/A	N/A	N/A	2.067	N/A
2.5	62.5	N/A	N/A	N/A	2.469	N/A
3	75	N/A	N/A	N/A	3.068	N/A
3.5	87.5	N/A	N/A	N/A	3.548	N/A
4	100	N/A	N/A	N/A	4.026	N/A
5	125	N/A	N/A	N/A	5.047	N/A
6	150	N/A	N/A	N/A	6.065	N/A
8	200	N/A	8.125	8.071	7.981	7.813
10	250	N/A	10.250	10.136	10.020	9.750
12	300	N/A	12.250	12.090	11.938	11.626
14	350	13.500	13.376	13.250	13.124	12.812
16	400	15.500	15.376	15.250	15.000	14.688
18	450	17.500	17.376	17.124	16.876	16.500
20	500	19.500	19.250	19.000	18.812	18.376
22	550	21.500	21.250	21.000	N/A	20.250
24	600	23.500	23.250	22.876	22.624	22.062
26	650	25.376	25.000	N/A	N/A	N/A
28	700	27.376	27.000	26.750	N/A	N/A
30	750	29.376	29.000	28.750	N/A	N/A
32	800	31.376	31.000	30.750	30.624	N/A
34	850	33.312	33.000	32.750	32.624	N/A
36	900	35.376	35.000	34.750	34.500	N/A
38	950	N/A	N/A	N/A	N/A	N/A
40	1000	N/A	N/A	N/A	N/A	N/A
42	1050	N/A	N/A	N/A	N/A	N/A
44	1100	N/A	N/A	N/A	N/A	N/A
46	1150	N/A	N/A	N/A	N/A	N/A
48	1200	N/A	N/A	N/A	N/A	N/A
52	1300	N/A	N/A	N/A	N/A	N/A

Nominal Size (incl	Nominal Size (mm)	10	20	30	40	60
0.125	3.13	N/A	N/A	N/A	0.068	N/A
0.25	6.25	N/A	N/A	N/A	0.088	N/A
0.375	9.39	N/A	N/A	N/A	0.091	N/A
0.5	12.5	N/A	N/A	N/A	0.109	N/A
0.75	18.75	N/A	N/A	N/A	0.113	N/A
1	25	N/A	N/A	N/A	0.133	N/A
1.25	31.75	N/A	N/A	N/A	0.140	N/A
1.5	37.5	N/A	N/A	N/A	0.145	N/A
2	50	N/A	N/A	N/A	0.154	N/A
2.5	62.5	N/A	N/A	N/A	0.203	N/A
3	75	N/A	N/A	N/A	0.216	N/A
3.5	87.5	N/A	N/A	N/A	0.226	N/A

4	**100**	N/A	N/A	N/A	0.237	N/A
5	**125**	N/A	N/A	N/A	0.258	N/A
6	**150**	N/A	N/A	N/A	0.280	N/A
8	**200**	N/A	0.250	0.277	0.322	0.406
10	**250**	N/A	0.250	0.307	0.365	0.500
12	**300**	N/A	0.250	0.330	0.406	0.562
14	**350**	0.250	0.312	0.375	0.438	0.594
16	**400**	0.250	0.312	0.375	0.500	0.656
18	**450**	0.250	0.312	0.438	0.562	0.750
20	**500**	0.250	0.375	0.500	0.594	0.812
22	**550**	0.250	0.375	0.500	N/A	0.875
24	**600**	0.250	0.375	0.562	0.688	0.969
26	**650**	0.312	0.500	N/A	N/A	N/A
28	**700**	0.312	0.500	0.625	N/A	N/A
30	**750**	0.312	0.500	0.625	N/A	N/A
32	**800**	0.312	0.500	0.625	0.688	N/A
34	**850**	0.344	0.500	0.625	0.688	N/A
36	**900**	0.312	0.500	0.625	0.750	N/A
38	**950**	N/A	N/A	N/A	N/A	N/A
40	**1000**	N/A	N/A	N/A	N/A	N/A
42	**1050**	N/A	N/A	N/A	N/A	N/A
44	**1100**	N/A	N/A	N/A	N/A	N/A
46	**1150**	N/A	N/A	N/A	N/A	N/A
48	**1200**	N/A	N/A	N/A	N/A	N/A
52	**1300**	N/A	N/A	N/A	N/A	N/A

6.19M-1985 (SS)

Schedule versus Pipe ID (inches)

CARBON STEEL							
80	100	120	140	160	STD	XS	XXS
0.215	N/A	N/A	N/A	N/A	0.269	0.215	N/A
0.302	N/A	N/A	N/A	N/A	0.364	0.302	N/A
0.423	N/A	N/A	N/A	N/A	0.493	0.423	N/A
0.546	N/A	N/A	N/A	0.466	0.622	0.546	0.252
0.742	N/A	N/A	N/A	0.612	0.824	0.742	0.434
0.957	N/A	N/A	N/A	0.815	1.049	0.957	0.599
1.278	N/A	N/A	N/A	1.160	1.380	1.278	0.896
1.500	N/A	N/A	N/A	1.338	1.610	1.500	1.100
1.939	N/A	N/A	N/A	1.687	2.067	1.939	1.503
2.323	N/A	N/A	N/A	2.125	2.469	2.323	1.771
2.900	N/A	N/A	N/A	2.624	3.068	2.900	2.300
3.364	N/A	N/A	N/A	N/A	3.548	3.364	N/A
3.826	N/A	3.624	N/A	3.438	4.026	3.826	3.152
4.813	N/A	4.563	N/A	4.313	5.047	4.813	4.063
5.761	N/A	5.501	N/A	5.187	6.065	5.761	4.897
7.625	7.437	7.187	7.001	6.813	7.981	7.625	6.875
9.562	9.312	9.062	8.750	8.500	10.020	9.750	8.750
11.374	11.062	10.750	10.500	10.126	12.000	11.750	10.750
12.500	12.124	11.812	11.500	11.188	13.250	13.000	N/A
14.312	13.938	13.562	13.124	12.812	15.250	15.000	N/A
16.124	15.688	15.250	14.876	14.438	17.250	17.000	N/A
17.938	17.438	17.000	16.500	16.062	19.250	19.000	N/A
19.750	19.250	18.750	18.250	17.750	21.250	21.000	N/A
21.562	20.938	20.376	19.876	19.312	23.250	23.000	N/A
N/A	N/A	N/A	N/A	N/A	25.250	25.000	N/A
N/A	N/A	N/A	N/A	N/A	27.250	27.000	N/A
N/A	N/A	N/A	N/A	N/A	29.250	29.000	N/A
N/A	N/A	N/A	N/A	N/A	31.250	31.000	N/A
N/A	N/A	N/A	N/A	N/A	33.250	33.000	N/A
N/A	N/A	N/A	N/A	N/A	35.250	35.000	N/A
N/A	N/A	N/A	N/A	N/A	37.250	37.000	N/A
N/A	N/A	N/A	N/A	N/A	39.250	39.000	N/A
N/A	N/A	N/A	N/A	N/A	41.250	41.000	N/A
N/A	N/A	N/A	N/A	N/A	43.250	43.000	N/A
N/A	N/A	N/A	N/A	N/A	45.250	45.000	N/A
N/A	N/A	N/A	N/A	N/A	47.250	47.000	N/A
N/A	N/A	N/A	N/A	N/A	51.250	51.000	N/A

Schedule versus Wall Thickness (inches)

CARBON STEEL							
80	100	120	140	160	STD	XS	XXS
0.095	N/A	N/A	N/A	N/A	0.068	0.095	N/A
0.119	N/A	N/A	N/A	N/A	0.088	0.119	N/A
0.126	N/A	N/A	N/A	N/A	0.091	0.126	N/A
0.147	N/A	N/A	N/A	0.187	0.109	0.147	0.294
0.154	N/A	N/A	N/A	0.219	0.113	0.154	0.308
0.179	N/A	N/A	N/A	0.250	0.133	0.179	0.358
0.191	N/A	N/A	N/A	0.250	0.140	0.191	0.382
0.200	N/A	N/A	N/A	0.281	0.145	0.200	0.400
0.218	N/A	N/A	N/A	0.344	0.154	0.218	0.436
0.276	N/A	N/A	N/A	0.375	0.203	0.276	0.552
0.300	N/A	N/A	N/A	0.438	0.216	0.300	0.600
0.318	N/A	N/A	N/A	N/A	0.226	0.318	N/A

0.337	N/A	0.438	N/A	0.531	0.237	0.337	0.674
0.375	N/A	0.500	N/A	0.625	0.258	0.375	0.750
0.432	N/A	0.562	N/A	0.719	0.280	0.432	0.864
0.500	0.594	0.719	0.812	0.906	0.322	0.500	0.875
0.594	0.719	0.844	1.000	1.125	0.365	0.500	1.000
0.688	0.844	1.000	1.125	1.312	0.375	0.500	1.000
0.750	0.938	1.094	1.250	1.406	0.375	0.500	N/A
0.844	1.031	1.219	1.438	1.594	0.375	0.500	N/A
0.938	1.156	1.375	1.562	1.781	0.375	0.500	N/A
1.031	1.281	1.500	1.750	1.969	0.375	0.500	N/A
1.125	1.375	1.625	1.875	2.125	0.375	0.500	N/A
1.219	1.531	1.812	2.062	2.344	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A

STAINLESS STEEL			
5S	**10S**	**40S**	**80S**
N/A	0.307	0.269	0.215
N/A	0.410	0.364	0.302
N/A	0.545	0.493	0.423
0.710	0.674	0.622	0.546
0.920	0.884	0.824	0.742
1.185	1.094	1.049	0.957
1.530	1.442	1.380	1.278
1.770	1.682	1.610	1.500
2.245	2.157	2.067	1.939
2.709	2.635	2.469	2.323
3.334	3.260	3.068	2.900
3.834	3.760	3.548	3.364
4.334	4.260	4.026	3.826
5.345	5.295	5.047	4.813
6.407	6.375	6.065	5.761
8.407	8.329	7.981	7.625
10.482	10.420	10.020	9.750
12.438	12.390	12.000	11.750
13.688	13.624	N/A	N/A
15.670	15.624	N/A	N/A
17.670	17.624	N/A	N/A
19.624	19.564	N/A	N/A
21.624	21.564	N/A	N/A
23.564	23.500	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
29.500	29.376	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

STAINLESS STEEL			
5S	**10S**	**40S**	**80S**
N/A	0.049	0.068	0.095
N/A	0.065	0.088	0.119
N/A	0.065	0.091	0.126
0.065	0.083	0.109	0.147
0.065	0.083	0.113	0.154
0.065	0.109	0.133	0.179
0.065	0.109	0.140	0.191
0.065	0.109	0.145	0.200
0.065	0.109	0.154	0.218
0.083	0.120	0.203	0.276
0.083	0.120	0.216	0.300
0.083	0.120	0.226	0.318

0.083	0.120	0.237	0.337
0.109	0.134	0.258	0.375
0.109	0.134	0.280	0.432
0.109	0.148	0.322	0.500
0.134	0.165	0.365	0.500
0.156	0.180	0.375	0.500
0.156	0.188	N/A	N/A
0.165	0.188	N/A	N/A
0.165	0.188	N/A	N/A
0.188	0.218	N/A	N/A
0.188	0.218	N/A	N/A
0.218	0.250	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
0.250	0.312	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

Project Name : Binak compressor station
Item Name : Glycol Transfer Pumps P-2103 A/B
Prepared by : M.Aryafar

PUMP CALCULATION

OPERATING DATA

Temperature (°C)	30
Density @ Op. (Kg/m3)	1115
Vapor pressure @ Op.(Bar a)	0.000
Viscosity @ Op. (cP)	85.86
Normal capacity (m3/hr)	5.0
Design Factor %	10%
Design capacity (m3/hr)	5.5

SUCTION PRESSURE CALCULATION AT Qd

		Bar g	m
Min. liquid level in tank	1>>>>>		0.60
Max. liquid level in tank	2>>>>>		4.50
Bottom of tank Distance from pump center line	3>>>>>		-0.16
Total suction pressure drop in line & fittings	4>>>>>	-0.080	-0.74
Drum operating pressure	5>>>>>	0.10	0.9
Min suction liquid pressure	1+3+4+5=6>>>>>	0.07	0.6

		Bar a	m
Absolute pressure	7>>>>>	1.013	-
Vapor pressure @ Op.	8>>>>>	0.00	-
Available NPSH	6-8+7=9>>>>>	1.08	9.9
Max required NPSH (by vendor)			

DISCHARGE PRESSURE CALCULATION AT Qd

		Bar g	m
Outlet pressure at injection point	10>>>>>	1.5	
Static head above pump axis	11>>>>>	0.2	2.2
Total discharge pressure drop in equipment	12>>>>>	0.0	
Total discharge pressure drop in line & fittings	13>>>>>	-0.14	
Calculated discharge pressure	10+11+12-13=14>>>>>	1.9	
Total discharge pressure	16+6>>>>>	2.07	

DIFFERENTIAL PRESSURE CALCULATION

		Bar	m
Differential pressure (at Qn)	14-6=15>>>>>	1.82	16.6
Estimated differential pressure (at Qn)	16≥15	2.0	18.3

DESIGN PRESSURE ESTIMATION

		Bar g	m
Maximum suction pressure	17>>>>>	0.49	5
20% of differential pressure at Qd	1.2X16=18>>>>>	2.4	
Pump design pressure (shut off pressure)	17+18=19>>>>>	2.9	

POWER CONSUMPTION ESTIMATION AT QD

Pump efficiency (Ep)	31%
Estimated hydraulic power @ Qd (KW)	0.3
Brake power (BHP) (hydraulic power/Ep)	1.0
Estimated efficiency of electro motor (EM)	-
Absorbed power (KW)	-

PRESSURE DROP CALCULATION

SUCTION PRESSURE DROP

Design capacity (m3/hr)	5.5	
Viscosity@ Op. (cP)	85.86	
Density @ Op. (Kg/m3)	1115.0	
E (m)	0.000046	
Pipe size (in)	3.0	
SCH	STD	
Thk (in)	0.22	
ID (m)	0.08	
Velocity (m/s)	0.32	
Re	324.3	
Friction factor (f)	0.10	
Pressure drop (bar/100m)	0.07151	
Acceptable Pressure Drop (bar/100m)- Base on design criteria	0.35	**OK**
Acceptable Velosity (m/s)- Base on design criteria	0.90	**OK**
E/D	0.00059	
a	3.20565	
b	3.20522	
a-b	0.00042	

	L/D	No.	
Ball/Gate Valve Fully Open Conventional	13	1	1.0
Check Valve Fully Open	135	0	0.0
Tee with Flow Through branch	20	1	1.5
Elbow 90 Long Radius	13	2	2.0
Line length	-	-	10
Static Head		M	0.0
Total Equi. Length (m)			14.5
			Bar
Strainer		1	0.07
Total Equi. Length (Bar)			-0.010
Total Pressure Drop (Bar)			-0.080

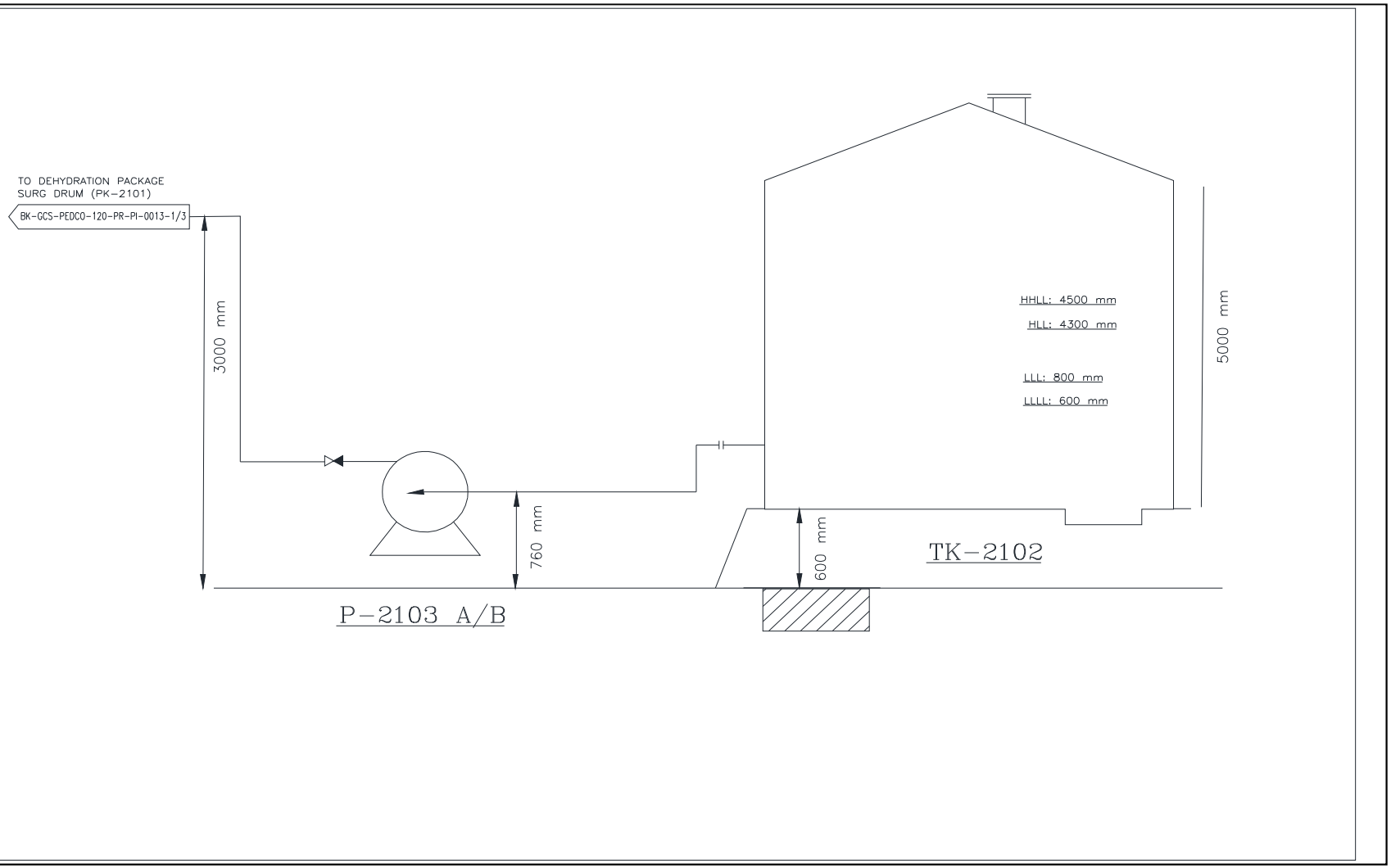
DISCHARG LINE PRESSURE DROP

Design capacity (m3/hr)	5.5	
Viscosity @ Op. (cP)	85.86	
Density @ Op. (Kg/m3)	1115.0	
E (m)	0.000046	
Pipe size (in)	2.0	
SCH	STD	
Thk (in)	0.15	
ID (m)	0.05	
Velocity (m/s)	0.71	
Re	481.4	
Friction factor (ƒ)	0.08290	
Pressure drop (bar/100m)	0.43885	
Acceptable Pressure Drop (bar/100m)- Base on design criteria	0.45	**OK**
Acceptable Velocity (m/s)- Base on design criteria	1.50	**OK**
E/D	0.00088	
a	3.47310	
b	3.47293	
a-b	0.00016	

	L/D	No.	
Ball/Gate Valve Fully Open Conventional	13	1	0.7
Check Valve Fully Open	135	1	6.9
Tee with Flow Through branch	60	1	3.0
Elbow 90 Long Radius	20	2	2.0
Line lenght	-	-	20
Static Head		M	0.0

Total Equi. Length (m)	32.6
Total Equi. Length (Bar)	-0.143
Total Pressure Drop (Bar)	-0.143

NOTES:


TO DEHYDRATION PACKAGE
SURG DRUM (PK-2101)
BK-GCS-PEDCO-120-PR-PI-0013-1/3
3000 mm
760 mm
600 mm
5000 mm
HHLL: 4500 mm
HLL: 4300 mm
LLL: 800 mm
LLLL: 600 mm
TK-2102
P-2103 A/B

Data shown below: ANSI / ASME B36.10M-1996 (CS), ANSI / ASME B3

Nominal Size (incl	Nominal Size (mm)	10	20	30	40	60
0.125	3.13	N/A	N/A	N/A	0.269	N/A
0.25	6.25	N/A	N/A	N/A	0.364	N/A
0.375	9.39	N/A	N/A	N/A	0.493	N/A
0.5	12.5	N/A	N/A	N/A	0.622	N/A
0.75	18.75	N/A	N/A	N/A	0.824	N/A
1	25	N/A	N/A	N/A	1.049	N/A
1.25	31.75	N/A	N/A	N/A	1.380	N/A
1.5	37.5	N/A	N/A	N/A	1.610	N/A
2	50	N/A	N/A	N/A	2.067	N/A
2.5	62.5	N/A	N/A	N/A	2.469	N/A
3	75	N/A	N/A	N/A	3.068	N/A
3.5	87.5	N/A	N/A	N/A	3.548	N/A
4	100	N/A	N/A	N/A	4.026	N/A
5	125	N/A	N/A	N/A	5.047	N/A
6	150	N/A	N/A	N/A	6.065	N/A
8	200	N/A	8.125	8.071	7.981	7.813
10	250	N/A	10.250	10.136	10.020	9.750
12	300	N/A	12.250	12.090	11.938	11.626
14	350	13.500	13.376	13.250	13.124	12.812
16	400	15.500	15.376	15.250	15.000	14.688
18	450	17.500	17.376	17.124	16.876	16.500
20	500	19.500	19.250	19.000	18.812	18.376
22	550	21.500	21.250	21.000	N/A	20.250
24	600	23.500	23.250	22.876	22.624	22.062
26	650	25.376	25.000	N/A	N/A	N/A
28	700	27.376	27.000	26.750	N/A	N/A
30	750	29.376	29.000	28.750	N/A	N/A
32	800	31.376	31.000	30.750	30.624	N/A
34	850	33.312	33.000	32.750	32.624	N/A
36	900	35.376	35.000	34.750	34.500	N/A
38	950	N/A	N/A	N/A	N/A	N/A
40	1000	N/A	N/A	N/A	N/A	N/A
42	1050	N/A	N/A	N/A	N/A	N/A
44	1100	N/A	N/A	N/A	N/A	N/A
46	1150	N/A	N/A	N/A	N/A	N/A
48	1200	N/A	N/A	N/A	N/A	N/A
52	1300	N/A	N/A	N/A	N/A	N/A

Nominal Size (incl	Nominal Size (mm)	10	20	30	40	60
0.125	3.13	N/A	N/A	N/A	0.068	N/A
0.25	6.25	N/A	N/A	N/A	0.088	N/A
0.375	9.39	N/A	N/A	N/A	0.091	N/A
0.5	12.5	N/A	N/A	N/A	0.109	N/A
0.75	18.75	N/A	N/A	N/A	0.113	N/A
1	25	N/A	N/A	N/A	0.133	N/A
1.25	31.75	N/A	N/A	N/A	0.140	N/A
1.5	37.5	N/A	N/A	N/A	0.145	N/A
2	50	N/A	N/A	N/A	0.154	N/A
2.5	62.5	N/A	N/A	N/A	0.203	N/A
3	75	N/A	N/A	N/A	0.216	N/A
3.5	87.5	N/A	N/A	N/A	0.226	N/A

4	**100**	N/A	N/A	N/A	0.237	N/A
5	**125**	N/A	N/A	N/A	0.258	N/A
6	**150**	N/A	N/A	N/A	0.280	N/A
8	**200**	N/A	0.250	0.277	0.322	0.406
10	**250**	N/A	0.250	0.307	0.365	0.500
12	**300**	N/A	0.250	0.330	0.406	0.562
14	**350**	0.250	0.312	0.375	0.438	0.594
16	**400**	0.250	0.312	0.375	0.500	0.656
18	**450**	0.250	0.312	0.438	0.562	0.750
20	**500**	0.250	0.375	0.500	0.594	0.812
22	**550**	0.250	0.375	0.500	N/A	0.875
24	**600**	0.250	0.375	0.562	0.688	0.969
26	**650**	0.312	0.500	N/A	N/A	N/A
28	**700**	0.312	0.500	0.625	N/A	N/A
30	**750**	0.312	0.500	0.625	N/A	N/A
32	**800**	0.312	0.500	0.625	0.688	N/A
34	**850**	0.344	0.500	0.625	0.688	N/A
36	**900**	0.312	0.500	0.625	0.750	N/A
38	**950**	N/A	N/A	N/A	N/A	N/A
40	**1000**	N/A	N/A	N/A	N/A	N/A
42	**1050**	N/A	N/A	N/A	N/A	N/A
44	**1100**	N/A	N/A	N/A	N/A	N/A
46	**1150**	N/A	N/A	N/A	N/A	N/A
48	**1200**	N/A	N/A	N/A	N/A	N/A
52	**1300**	N/A	N/A	N/A	N/A	N/A

6.19M-1985 (SS)

Schedule versus Pipe ID (inches)

CARBON STEEL							
80	100	120	140	160	STD	XS	XXS
0.215	N/A	N/A	N/A	N/A	0.269	0.215	N/A
0.302	N/A	N/A	N/A	N/A	0.364	0.302	N/A
0.423	N/A	N/A	N/A	N/A	0.493	0.423	N/A
0.546	N/A	N/A	N/A	0.466	0.622	0.546	0.252
0.742	N/A	N/A	N/A	0.612	0.824	0.742	0.434
0.957	N/A	N/A	N/A	0.815	1.049	0.957	0.599
1.278	N/A	N/A	N/A	1.160	1.380	1.278	0.896
1.500	N/A	N/A	N/A	1.338	1.610	1.500	1.100
1.939	N/A	N/A	N/A	1.687	2.067	1.939	1.503
2.323	N/A	N/A	N/A	2.125	2.469	2.323	1.771
2.900	N/A	N/A	N/A	2.624	3.068	2.900	2.300
3.364	N/A	N/A	N/A	N/A	3.548	3.364	N/A
3.826	N/A	3.624	N/A	3.438	4.026	3.826	3.152
4.813	N/A	4.563	N/A	4.313	5.047	4.813	4.063
5.761	N/A	5.501	N/A	5.187	6.065	5.761	4.897
7.625	7.437	7.187	7.001	6.813	7.981	7.625	6.875
9.562	9.312	9.062	8.750	8.500	10.020	9.750	8.750
11.374	11.062	10.750	10.500	10.126	12.000	11.750	10.750
12.500	12.124	11.812	11.500	11.188	13.250	13.000	N/A
14.312	13.938	13.562	13.124	12.812	15.250	15.000	N/A
16.124	15.688	15.250	14.876	14.438	17.250	17.000	N/A
17.938	17.438	17.000	16.500	16.062	19.250	19.000	N/A
19.750	19.250	18.750	18.250	17.750	21.250	21.000	N/A
21.562	20.938	20.376	19.876	19.312	23.250	23.000	N/A
N/A	N/A	N/A	N/A	N/A	25.250	25.000	N/A
N/A	N/A	N/A	N/A	N/A	27.250	27.000	N/A
N/A	N/A	N/A	N/A	N/A	29.250	29.000	N/A
N/A	N/A	N/A	N/A	N/A	31.250	31.000	N/A
N/A	N/A	N/A	N/A	N/A	33.250	33.000	N/A
N/A	N/A	N/A	N/A	N/A	35.250	35.000	N/A
N/A	N/A	N/A	N/A	N/A	37.250	37.000	N/A
N/A	N/A	N/A	N/A	N/A	39.250	39.000	N/A
N/A	N/A	N/A	N/A	N/A	41.250	41.000	N/A
N/A	N/A	N/A	N/A	N/A	43.250	43.000	N/A
N/A	N/A	N/A	N/A	N/A	45.250	45.000	N/A
N/A	N/A	N/A	N/A	N/A	47.250	47.000	N/A
N/A	N/A	N/A	N/A	N/A	51.250	51.000	N/A

Schedule versus Wall Thickness (inches)

CARBON STEEL							
80	100	120	140	160	STD	XS	XXS
0.095	N/A	N/A	N/A	N/A	0.068	0.095	N/A
0.119	N/A	N/A	N/A	N/A	0.088	0.119	N/A
0.126	N/A	N/A	N/A	N/A	0.091	0.126	N/A
0.147	N/A	N/A	N/A	0.187	0.109	0.147	0.294
0.154	N/A	N/A	N/A	0.219	0.113	0.154	0.308
0.179	N/A	N/A	N/A	0.250	0.133	0.179	0.358
0.191	N/A	N/A	N/A	0.250	0.140	0.191	0.382
0.200	N/A	N/A	N/A	0.281	0.145	0.200	0.400
0.218	N/A	N/A	N/A	0.344	0.154	0.218	0.436
0.276	N/A	N/A	N/A	0.375	0.203	0.276	0.552
0.300	N/A	N/A	N/A	0.438	0.216	0.300	0.600
0.318	N/A	N/A	N/A	N/A	0.226	0.318	N/A

0.337	N/A	0.438	N/A	0.531	0.237	0.337	0.674
0.375	N/A	0.500	N/A	0.625	0.258	0.375	0.750
0.432	N/A	0.562	N/A	0.719	0.280	0.432	0.864
0.500	0.594	0.719	0.812	0.906	0.322	0.500	0.875
0.594	0.719	0.844	1.000	1.125	0.365	0.500	1.000
0.688	0.844	1.000	1.125	1.312	0.375	0.500	1.000
0.750	0.938	1.094	1.250	1.406	0.375	0.500	N/A
0.844	1.031	1.219	1.438	1.594	0.375	0.500	N/A
0.938	1.156	1.375	1.562	1.781	0.375	0.500	N/A
1.031	1.281	1.500	1.750	1.969	0.375	0.500	N/A
1.125	1.375	1.625	1.875	2.125	0.375	0.500	N/A
1.219	1.531	1.812	2.062	2.344	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A

STAINLESS STEEL			
5S	**10S**	**40S**	**80S**
N/A	0.307	0.269	0.215
N/A	0.410	0.364	0.302
N/A	0.545	0.493	0.423
0.710	0.674	0.622	0.546
0.920	0.884	0.824	0.742
1.185	1.094	1.049	0.957
1.530	1.442	1.380	1.278
1.770	1.682	1.610	1.500
2.245	2.157	2.067	1.939
2.709	2.635	2.469	2.323
3.334	3.260	3.068	2.900
3.834	3.760	3.548	3.364
4.334	4.260	4.026	3.826
5.345	5.295	5.047	4.813
6.407	6.375	6.065	5.761
8.407	8.329	7.981	7.625
10.482	10.420	10.020	9.750
12.438	12.390	12.000	11.750
13.688	13.624	N/A	N/A
15.670	15.624	N/A	N/A
17.670	17.624	N/A	N/A
19.624	19.564	N/A	N/A
21.624	21.564	N/A	N/A
23.564	23.500	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
29.500	29.376	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

STAINLESS STEEL			
5S	**10S**	**40S**	**80S**
N/A	0.049	0.068	0.095
N/A	0.065	0.088	0.119
N/A	0.065	0.091	0.126
0.065	0.083	0.109	0.147
0.065	0.083	0.113	0.154
0.065	0.109	0.133	0.179
0.065	0.109	0.140	0.191
0.065	0.109	0.145	0.200
0.065	0.109	0.154	0.218
0.083	0.120	0.203	0.276
0.083	0.120	0.216	0.300
0.083	0.120	0.226	0.318

0.083	0.120	0.237	0.337
0.109	0.134	0.258	0.375
0.109	0.134	0.280	0.432
0.109	0.148	0.322	0.500
0.134	0.165	0.365	0.500
0.156	0.180	0.375	0.500
0.156	0.188	N/A	N/A
0.165	0.188	N/A	N/A
0.165	0.188	N/A	N/A
0.188	0.218	N/A	N/A
0.188	0.218	N/A	N/A
0.218	0.250	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
0.250	0.312	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

Project Name : Binak compressor station
Item Name : Glycol Drain Pump P-2104
Prepared by : M.Aryafar

PUMP CALCULATION

OPERATING DATA

Temperature (°C)	5.0
Density @ Op. (Kg/m3)	1115
Vapor pressure @ Op.(Bar a)	0.000
Viscosity @ Op. (cP)	85.86
Normal capacity (m3/hr)	3.0
Design Factor %	10%
Design capacity (m3/hr)	3.3

SUCTION PRESSURE CALCULATION AT Qd

		Bar g	m
Min. liquid level	1>>>>>		0.05
Max. liquid level	2>>>>>		0.70
Defrent level pump nozzle and suction point	3>>>>>		0.0
Total suction pressure drop in line & fittings	4>>>>>	-	-
Drum operating pressure	5>>>>>	0.10	0.9
Min suction liquid pressure	1+3+4+5=6>>>>>	0.11	1.0

		Bar a	m
Absolute pressure	7>>>>>	1.030	-
Vapor pressure @ Op.	8>>>>>	0.00	-
Available NPSH	6-8+7=9>>>>>	1.135	10.4
Max required NPSH (by vendor)			

DISCHARGE PRESSURE CALCULATION AT Qd

		Bar g	m
Outlet pressure at injection point	10>>>>>	1.5	
Static head above pump axis	11>>>>>	0.5	4.5
Total discharge pressure drop in equipment	12>>>>>	0.0	
Total discharge pressure drop in line & fittings	13>>>>>	-0.085	
Calculated discharge pressure	10+11+12-13=14>>>>>	2.1	
Total discharge pressure	16+6>>>>>	2.1	

DIFFERENTIAL PRESSURE CALCULATION

		Bar	m
Differential pressure (at Qn)	14-9=15>>>>>	2.0	18.0
Estimated differential pressure (at Qn)	16≥15	2.0	18.3

DESIGN PRESSURE ESTIMATION

		Bar g	m
Maximum suction pressure	16>>>>>	0.2	2
20% of differential pressure at Qd	1.2X15=17>>>>>	2.4	
Pump design pressure (shut off pressure)	16+17=18>>>>>	2.6	

POWER CONSUMPTION ESTIMATION AT QD

Pump efficiency (Ep)	22%
Estimated hydraulic power @ Qd (KW)	0.18
Brake power (BHP) (hydraulic power/Ep)	0.83
Estimated efficiency of electro motor (EM)	-
Absorbed power (KW)	-

PRESSURE DROP CALCULATION

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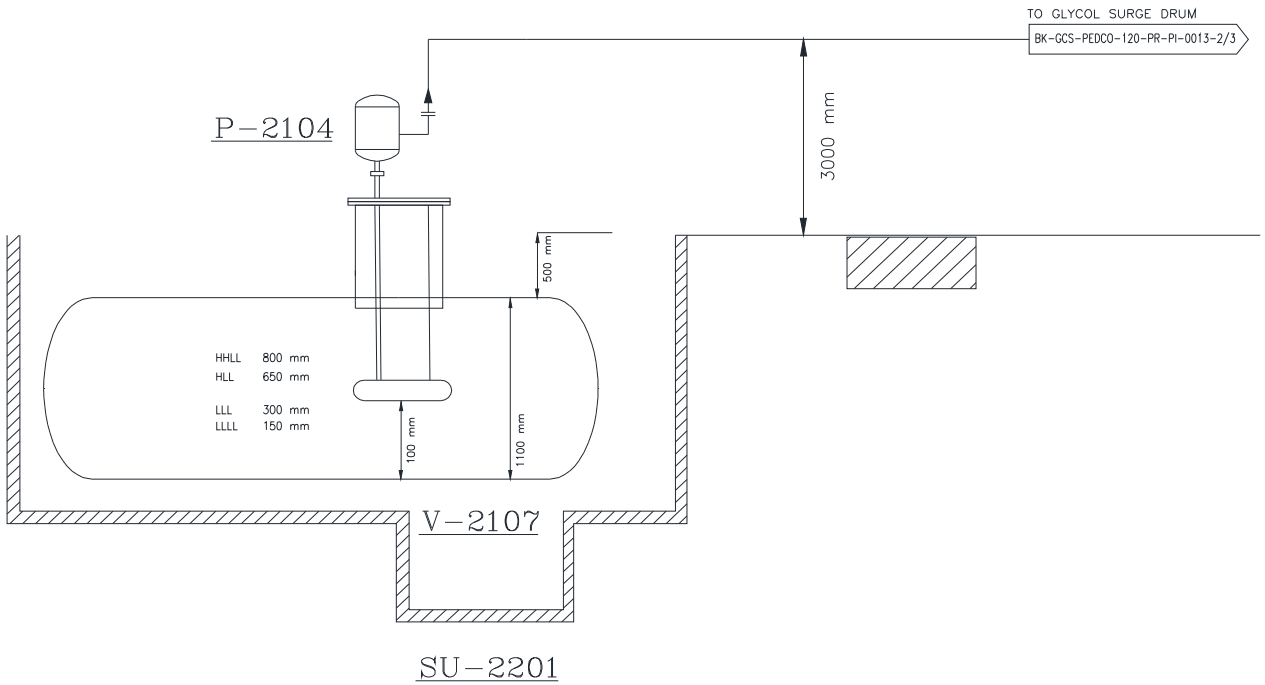
DISCHARG LINE PRESSURE DROP

Design capacity (m3/hr)	3.3	
Viscosity @ Op. (cP)	85.86	
Density @ Op. (Kg/m3)	1115.0	
E (m)	0.000046	
Pipe size (in)	2.0	
SCH	STD	
Thk (in)	0.15	
ID (m)	0.05	
Velosity (m/s)	0.42	
Re	288.8	
Friction factor (ƒ)	0.10240	
Pressure drop (bar/100m)	0.19515	
Acceptable Pressure Drop (bar/100m)- Base on design criteria	0.45	**OK**
Acceptable Velosity (m/s)- Base on design criteria	1.50	**OK**
E/D	0.00088	
a	3.12498	
b	3.12472	
a-b	0.00026	

	L/D	No.	
Ball/Gate Valve Fully Open Conven	13	1	0.7
Check Valve Fully Open	135	1	6.9
Tee with Flow Through branch	60	1	3.0
Elbow 90 Long Radius	20	3	3.0
Line lenght	-	-	30
Static Head		M	0.0
Total Equi. Length (m)			43.6
			-0.085
Total Pressure Drop (Bar)			-0.085


TO GLYCOL SURGE DRUM
BK-GCS-PEDCO-120-PR-PI-0013-2/3
P-2104
3000 mm
500 mm
HHLL 800 mm
HLL 650 mm
LLL 300 mm
LLLL 150 mm
100 mm
1100 mm
V-2107
SU-2201

Data shown below: ANSI / ASME B36.10M-1996 (CS), ANSI / ASME B3

Nominal Size (incl	Nominal Size (mm)	10	20	30	40	60
0.125	3.13	N/A	N/A	N/A	0.269	N/A
0.25	6.25	N/A	N/A	N/A	0.364	N/A
0.375	9.39	N/A	N/A	N/A	0.493	N/A
0.5	12.5	N/A	N/A	N/A	0.622	N/A
0.75	18.75	N/A	N/A	N/A	0.824	N/A
1	25	N/A	N/A	N/A	1.049	N/A
1.25	31.75	N/A	N/A	N/A	1.380	N/A
1.5	37.5	N/A	N/A	N/A	1.610	N/A
2	50	N/A	N/A	N/A	2.067	N/A
2.5	62.5	N/A	N/A	N/A	2.469	N/A
3	75	N/A	N/A	N/A	3.068	N/A
3.5	87.5	N/A	N/A	N/A	3.548	N/A
4	100	N/A	N/A	N/A	4.026	N/A
5	125	N/A	N/A	N/A	5.047	N/A
6	150	N/A	N/A	N/A	6.065	N/A
8	200	N/A	8.125	8.071	7.981	7.813
10	250	N/A	10.250	10.136	10.020	9.750
12	300	N/A	12.250	12.090	11.938	11.626
14	350	13.500	13.376	13.250	13.124	12.812
16	400	15.500	15.376	15.250	15.000	14.688
18	450	17.500	17.376	17.124	16.876	16.500
20	500	19.500	19.250	19.000	18.812	18.376
22	550	21.500	21.250	21.000	N/A	20.250
24	600	23.500	23.250	22.876	22.624	22.062
26	650	25.376	25.000	N/A	N/A	N/A
28	700	27.376	27.000	26.750	N/A	N/A
30	750	29.376	29.000	28.750	N/A	N/A
32	800	31.376	31.000	30.750	30.624	N/A
34	850	33.312	33.000	32.750	32.624	N/A
36	900	35.376	35.000	34.750	34.500	N/A
38	950	N/A	N/A	N/A	N/A	N/A
40	1000	N/A	N/A	N/A	N/A	N/A
42	1050	N/A	N/A	N/A	N/A	N/A
44	1100	N/A	N/A	N/A	N/A	N/A
46	1150	N/A	N/A	N/A	N/A	N/A
48	1200	N/A	N/A	N/A	N/A	N/A
52	1300	N/A	N/A	N/A	N/A	N/A

Nominal Size (incl	Nominal Size (mm)	10	20	30	40	60
0.125	3.13	N/A	N/A	N/A	0.068	N/A
0.25	6.25	N/A	N/A	N/A	0.088	N/A
0.375	9.39	N/A	N/A	N/A	0.091	N/A
0.5	12.5	N/A	N/A	N/A	0.109	N/A
0.75	18.75	N/A	N/A	N/A	0.113	N/A
1	25	N/A	N/A	N/A	0.133	N/A
1.25	31.75	N/A	N/A	N/A	0.140	N/A
1.5	37.5	N/A	N/A	N/A	0.145	N/A
2	50	N/A	N/A	N/A	0.154	N/A
2.5	62.5	N/A	N/A	N/A	0.203	N/A
3	75	N/A	N/A	N/A	0.216	N/A
3.5	87.5	N/A	N/A	N/A	0.226	N/A

4	**100**	N/A	N/A	N/A	0.237	N/A
5	**125**	N/A	N/A	N/A	0.258	N/A
6	**150**	N/A	N/A	N/A	0.280	N/A
8	**200**	N/A	0.250	0.277	0.322	0.406
10	**250**	N/A	0.250	0.307	0.365	0.500
12	**300**	N/A	0.250	0.330	0.406	0.562
14	**350**	0.250	0.312	0.375	0.438	0.594
16	**400**	0.250	0.312	0.375	0.500	0.656
18	**450**	0.250	0.312	0.438	0.562	0.750
20	**500**	0.250	0.375	0.500	0.594	0.812
22	**550**	0.250	0.375	0.500	N/A	0.875
24	**600**	0.250	0.375	0.562	0.688	0.969
26	**650**	0.312	0.500	N/A	N/A	N/A
28	**700**	0.312	0.500	0.625	N/A	N/A
30	**750**	0.312	0.500	0.625	N/A	N/A
32	**800**	0.312	0.500	0.625	0.688	N/A
34	**850**	0.344	0.500	0.625	0.688	N/A
36	**900**	0.312	0.500	0.625	0.750	N/A
38	**950**	N/A	N/A	N/A	N/A	N/A
40	**1000**	N/A	N/A	N/A	N/A	N/A
42	**1050**	N/A	N/A	N/A	N/A	N/A
44	**1100**	N/A	N/A	N/A	N/A	N/A
46	**1150**	N/A	N/A	N/A	N/A	N/A
48	**1200**	N/A	N/A	N/A	N/A	N/A
52	**1300**	N/A	N/A	N/A	N/A	N/A

6.19M-1985 (SS)

Schedule versus Pipe ID (inches)

CARBON STEEL							
80	100	120	140	160	STD	XS	XXS
0.215	N/A	N/A	N/A	N/A	0.269	0.215	N/A
0.302	N/A	N/A	N/A	N/A	0.364	0.302	N/A
0.423	N/A	N/A	N/A	N/A	0.493	0.423	N/A
0.546	N/A	N/A	N/A	0.466	0.622	0.546	0.252
0.742	N/A	N/A	N/A	0.612	0.824	0.742	0.434
0.957	N/A	N/A	N/A	0.815	1.049	0.957	0.599
1.278	N/A	N/A	N/A	1.160	1.380	1.278	0.896
1.500	N/A	N/A	N/A	1.338	1.610	1.500	1.100
1.939	N/A	N/A	N/A	1.687	2.067	1.939	1.503
2.323	N/A	N/A	N/A	2.125	2.469	2.323	1.771
2.900	N/A	N/A	N/A	2.624	3.068	2.900	2.300
3.364	N/A	N/A	N/A	N/A	3.548	3.364	N/A
3.826	N/A	3.624	N/A	3.438	4.026	3.826	3.152
4.813	N/A	4.563	N/A	4.313	5.047	4.813	4.063
5.761	N/A	5.501	N/A	5.187	6.065	5.761	4.897
7.625	7.437	7.187	7.001	6.813	7.981	7.625	6.875
9.562	9.312	9.062	8.750	8.500	10.020	9.750	8.750
11.374	11.062	10.750	10.500	10.126	12.000	11.750	10.750
12.500	12.124	11.812	11.500	11.188	13.250	13.000	N/A
14.312	13.938	13.562	13.124	12.812	15.250	15.000	N/A
16.124	15.688	15.250	14.876	14.438	17.250	17.000	N/A
17.938	17.438	17.000	16.500	16.062	19.250	19.000	N/A
19.750	19.250	18.750	18.250	17.750	21.250	21.000	N/A
21.562	20.938	20.376	19.876	19.312	23.250	23.000	N/A
N/A	N/A	N/A	N/A	N/A	25.250	25.000	N/A
N/A	N/A	N/A	N/A	N/A	27.250	27.000	N/A
N/A	N/A	N/A	N/A	N/A	29.250	29.000	N/A
N/A	N/A	N/A	N/A	N/A	31.250	31.000	N/A
N/A	N/A	N/A	N/A	N/A	33.250	33.000	N/A
N/A	N/A	N/A	N/A	N/A	35.250	35.000	N/A
N/A	N/A	N/A	N/A	N/A	37.250	37.000	N/A
N/A	N/A	N/A	N/A	N/A	39.250	39.000	N/A
N/A	N/A	N/A	N/A	N/A	41.250	41.000	N/A
N/A	N/A	N/A	N/A	N/A	43.250	43.000	N/A
N/A	N/A	N/A	N/A	N/A	45.250	45.000	N/A
N/A	N/A	N/A	N/A	N/A	47.250	47.000	N/A
N/A	N/A	N/A	N/A	N/A	51.250	51.000	N/A

Schedule versus Wall Thickness (inches)

CARBON STEEL							
80	100	120	140	160	STD	XS	XXS
0.095	N/A	N/A	N/A	N/A	0.068	0.095	N/A
0.119	N/A	N/A	N/A	N/A	0.088	0.119	N/A
0.126	N/A	N/A	N/A	N/A	0.091	0.126	N/A
0.147	N/A	N/A	N/A	0.187	0.109	0.147	0.294
0.154	N/A	N/A	N/A	0.219	0.113	0.154	0.308
0.179	N/A	N/A	N/A	0.250	0.133	0.179	0.358
0.191	N/A	N/A	N/A	0.250	0.140	0.191	0.382
0.200	N/A	N/A	N/A	0.281	0.145	0.200	0.400
0.218	N/A	N/A	N/A	0.344	0.154	0.218	0.436
0.276	N/A	N/A	N/A	0.375	0.203	0.276	0.552
0.300	N/A	N/A	N/A	0.438	0.216	0.300	0.600
0.318	N/A	N/A	N/A	N/A	0.226	0.318	N/A

0.337	N/A	0.438	N/A	0.531	0.237	0.337	0.674
0.375	N/A	0.500	N/A	0.625	0.258	0.375	0.750
0.432	N/A	0.562	N/A	0.719	0.280	0.432	0.864
0.500	0.594	0.719	0.812	0.906	0.322	0.500	0.875
0.594	0.719	0.844	1.000	1.125	0.365	0.500	1.000
0.688	0.844	1.000	1.125	1.312	0.375	0.500	1.000
0.750	0.938	1.094	1.250	1.406	0.375	0.500	N/A
0.844	1.031	1.219	1.438	1.594	0.375	0.500	N/A
0.938	1.156	1.375	1.562	1.781	0.375	0.500	N/A
1.031	1.281	1.500	1.750	1.969	0.375	0.500	N/A
1.125	1.375	1.625	1.875	2.125	0.375	0.500	N/A
1.219	1.531	1.812	2.062	2.344	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A

STAINLESS STEEL			
5S	**10S**	**40S**	**80S**
N/A	0.307	0.269	0.215
N/A	0.410	0.364	0.302
N/A	0.545	0.493	0.423
0.710	0.674	0.622	0.546
0.920	0.884	0.824	0.742
1.185	1.094	1.049	0.957
1.530	1.442	1.380	1.278
1.770	1.682	1.610	1.500
2.245	2.157	2.067	1.939
2.709	2.635	2.469	2.323
3.334	3.260	3.068	2.900
3.834	3.760	3.548	3.364
4.334	4.260	4.026	3.826
5.345	5.295	5.047	4.813
6.407	6.375	6.065	5.761
8.407	8.329	7.981	7.625
10.482	10.420	10.020	9.750
12.438	12.390	12.000	11.750
13.688	13.624	N/A	N/A
15.670	15.624	N/A	N/A
17.670	17.624	N/A	N/A
19.624	19.564	N/A	N/A
21.624	21.564	N/A	N/A
23.564	23.500	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
29.500	29.376	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

STAINLESS STEEL			
5S	**10S**	**40S**	**80S**
N/A	0.049	0.068	0.095
N/A	0.065	0.088	0.119
N/A	0.065	0.091	0.126
0.065	0.083	0.109	0.147
0.065	0.083	0.113	0.154
0.065	0.109	0.133	0.179
0.065	0.109	0.140	0.191
0.065	0.109	0.145	0.200
0.065	0.109	0.154	0.218
0.083	0.120	0.203	0.276
0.083	0.120	0.216	0.300
0.083	0.120	0.226	0.318

0.083	0.120	0.237	0.337
0.109	0.134	0.258	0.375
0.109	0.134	0.280	0.432
0.109	0.148	0.322	0.500
0.134	0.165	0.365	0.500
0.156	0.180	0.375	0.500
0.156	0.188	N/A	N/A
0.165	0.188	N/A	N/A
0.165	0.188	N/A	N/A
0.188	0.218	N/A	N/A
0.188	0.218	N/A	N/A
0.218	0.250	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
0.250	0.312	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

Project Name : Binak compressor station
Item Name : Flare Drum Pump P-2201
Prepared by : M.Aryafar

PUMP CALCULATION

OPERATING DATA

Temperature (°C)	5.0
Density @ Op. (Kg/m3)	980.0
Vapor pressure(Bar a)	1.00
Viscosity @ Op. (cP)	0.46
Normal capacity (m3/hr)	2.0
Dedign Factor %	10%
Design capacity (m3/hr)	2.2

SUCTION PRESSURE CALCULATION AT Qd

		Bar g	m
Min. liquid level in drum	1>>>>>		0.15
Max. liquid level in drum	2>>>>>		0.65
Bottom of drum Distanc from pump center line	3>>>>>		1.30
Total suction pressure drop in line & fittings	4>>>>>	-0.074	-0.77
Minimum Drum operating pressure	5>>>>>	0.0	0.0
Maximum Drum operating pressure		0.5	5.2
Min suction liquid pressure	1+3+4+5=6>>>>>	0.07	0.7
Drum DESIGN pressure	6*>>>>	7.50	
		Bar a	m
Absolute pressure	7>>>>>	1.030	-
Vapor pressure @ Op.	8>>>>>	1.00	-
Available NPSH	6-8+7=9>>>>>	0.10	1.0
Max required NPSH (by vendor)			

DISCHARGE PRESSURE CALCULATION AT Qd

		Bar g	m
Outlet pressure at injection point	10>>>>>	0.8	
Static head above pump axis	11>>>>>	0.31	3.2
Total discharge pressure drop in equipment	12>>>>>	0.0	
Total discharge pressure drop in line & fittings	13>>>>>	-0.11	
Calculated discharge pressure	10+11+12-13=14>>>>>	1.21	
Total discharge pressure	16+6>>>>>	1.6	

DIFFERENTIAL PRESSURE CALCULATION

		Bar	m
Differential pressure (at Qn)	14-6=15>>>>>	1.1	12.0
Estimated differential pressure (at Qn)	16≥15>>>>>	1.5	15.6

DESIGN PRESSURE ESTIMATION

		Bar g	m
Maximum suction pressure	17>>>>>	0.6	6
Differential pressure at Qd	16+6*=18>>>>>	9.0	
Pump design pressure (shut off pressure)	17+18=19>>>>>	9.6	

POWER CONSUMPTION ESTIMATION AT QD

Pump efficiency (Ep)	15%
Estimated hydraulic power @ Qd (KW)	0.1
Brake power (BHP) (hydraulic power/Ep)	0.6
Estimated efficiency of electro motor (EM)	-
Absorbed power (KW)	-

PRESSURE DROP CALCULATION

SUCTION PRESSURE DROP

Design capacity (m3/hr)	2.2	
Viscosity @ Op. (cP)	0.46	
Density @ Op. (Kg/m3)	980.0	
E (m)	0.00005	
Pipe size (in)	2.0	
SCH	STD	
Thk (in)	0.15	
ID (m)	0.05	
Velosity (m/s)	0.28	
Re	31866.7	
Friction factor (ſ)	0.03	
Pressure drop (bar/100m)	0.02	
Acceptable Pressure Drop (bar/100m)- Base on design criteria	0.35	**OK**
Acceptable Velosity (m/s)- Base on design criteria	0.90	**OK**
E/D	0.00088	
a	6.27219	
b	6.27236	
a-b	-0.00018	

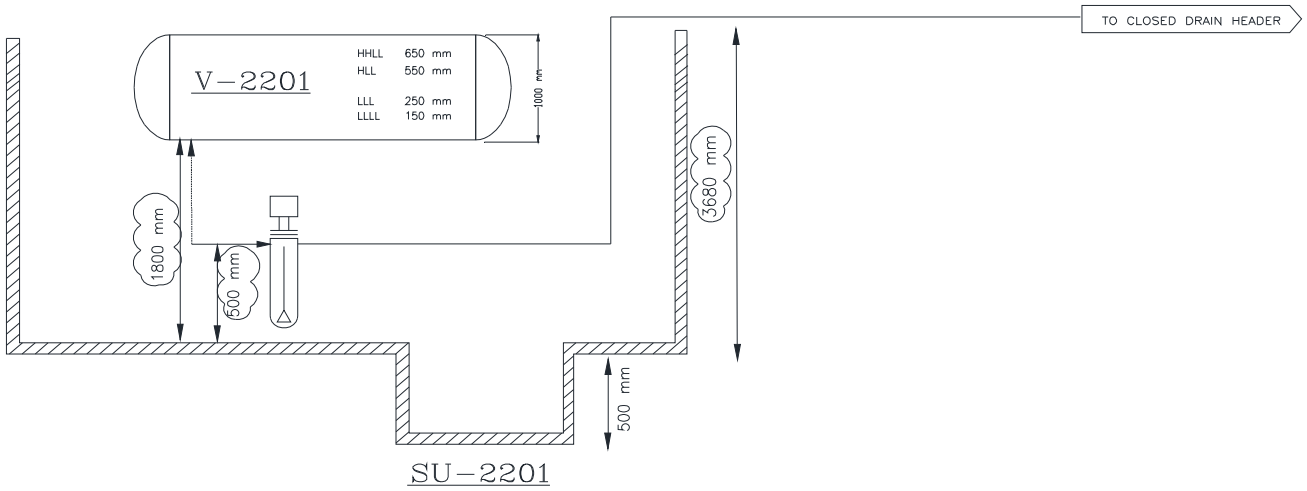
	L/D	No.	
Ball Valve Fully Open Conventional	13	1	0.7
Check Valve Fully Open	135	0	0.0
Tee with Flow Through branch	20	2	2.0
Elbow 90 Long Radius	13	3	2.0
Line lenght	-	-	15
Static Head		M	0.0
Total Equi. Length (m)			19.7
			Bar
Strainer		1	0.07
Total Equi. Length (Bar)			-0.004
Total Pressure Drop (Bar)			-0.074

DISCHARG LINE PRESSURE DROP

Design capacity (m3/hr)	2.2	
Viscosity @ Op. (cP)	0.46	
Density @ Op. (Kg/m3)	980.0	
E (m)	0.000046	
Pipe size (in)	2.0	
SCH	STD	
Thk (in)	0.15	
ID (m)	0.05	
Velosity (m/s)	0.28	
Re	31866.7	
Friction factor (ſ)	0.02542	
Pressure drop (bar/100m)	0.01892	
Acceptable Pressure Drop (bar/100m)- Base on design criteria	0.45	**OK**
Acceptable Velosity (m/s)- Base on design criteria	1.50	**OK**
E/D	0.00088	
a	6.27219	
b	6.27236	
a-b	-0.00018	

	L/D	No.	
Ball/Gate Valve Fully Open Convent	13	3	2.0
Check Valve Fully Open	135	1	6.9
Tee with Flow Through branch	60	4	12.2
Elbow 90 Long Radius	20	3	3.0
Line lenght	-	-	550
Static Head		M	0.0
Total Equi. Length (m)			574.1
Total Equi. Length (Bar)			-0.109
Total Pressure Drop (Bar)			-0.109

NOTES:


TO CLOSED DRAIN HEADER
V-2201
HHLL 650 mm
HLL 550 mm
LLL 250 mm
LLLL 150 mm
1000 mm
1800 mm
500 mm
3680 mm
500 mm
SU-2201

Data shown below: ANSI / ASME B36.10M-1996 (CS), ANSI / ASME B3

Nominal Size (incl	Nominal Size (mm)	10	20	30	40	60
0.125	3.13	N/A	N/A	N/A	0.269	N/A
0.25	6.25	N/A	N/A	N/A	0.364	N/A
0.375	9.39	N/A	N/A	N/A	0.493	N/A
0.5	12.5	N/A	N/A	N/A	0.622	N/A
0.75	18.75	N/A	N/A	N/A	0.824	N/A
1	25	N/A	N/A	N/A	1.049	N/A
1.25	31.75	N/A	N/A	N/A	1.380	N/A
1.5	37.5	N/A	N/A	N/A	1.610	N/A
2	50	N/A	N/A	N/A	2.067	N/A
2.5	62.5	N/A	N/A	N/A	2.469	N/A
3	75	N/A	N/A	N/A	3.068	N/A
3.5	87.5	N/A	N/A	N/A	3.548	N/A
4	100	N/A	N/A	N/A	4.026	N/A
5	125	N/A	N/A	N/A	5.047	N/A
6	150	N/A	N/A	N/A	6.065	N/A
8	200	N/A	8.125	8.071	7.981	7.813
10	250	N/A	10.250	10.136	10.020	9.750
12	300	N/A	12.250	12.090	11.938	11.626
14	350	13.500	13.376	13.250	13.124	12.812
16	400	15.500	15.376	15.250	15.000	14.688
18	450	17.500	17.376	17.124	16.876	16.500
20	500	19.500	19.250	19.000	18.812	18.376
22	550	21.500	21.250	21.000	N/A	20.250
24	600	23.500	23.250	22.876	22.624	22.062
26	650	25.376	25.000	N/A	N/A	N/A
28	700	27.376	27.000	26.750	N/A	N/A
30	750	29.376	29.000	28.750	N/A	N/A
32	800	31.376	31.000	30.750	30.624	N/A
34	850	33.312	33.000	32.750	32.624	N/A
36	900	35.376	35.000	34.750	34.500	N/A
38	950	N/A	N/A	N/A	N/A	N/A
40	1000	N/A	N/A	N/A	N/A	N/A
42	1050	N/A	N/A	N/A	N/A	N/A
44	1100	N/A	N/A	N/A	N/A	N/A
46	1150	N/A	N/A	N/A	N/A	N/A
48	1200	N/A	N/A	N/A	N/A	N/A
52	1300	N/A	N/A	N/A	N/A	N/A

Nominal Size (incl	Nominal Size (mm)	10	20	30	40	60
0.125	3.13	N/A	N/A	N/A	0.068	N/A
0.25	6.25	N/A	N/A	N/A	0.088	N/A
0.375	9.39	N/A	N/A	N/A	0.091	N/A
0.5	12.5	N/A	N/A	N/A	0.109	N/A
0.75	18.75	N/A	N/A	N/A	0.113	N/A
1	25	N/A	N/A	N/A	0.133	N/A
1.25	31.75	N/A	N/A	N/A	0.140	N/A
1.5	37.5	N/A	N/A	N/A	0.145	N/A
2	50	N/A	N/A	N/A	0.154	N/A
2.5	62.5	N/A	N/A	N/A	0.203	N/A
3	75	N/A	N/A	N/A	0.216	N/A
3.5	87.5	N/A	N/A	N/A	0.226	N/A

4	**100**	N/A	N/A	N/A	0.237	N/A
5	**125**	N/A	N/A	N/A	0.258	N/A
6	**150**	N/A	N/A	N/A	0.280	N/A
8	**200**	N/A	0.250	0.277	0.322	0.406
10	**250**	N/A	0.250	0.307	0.365	0.500
12	**300**	N/A	0.250	0.330	0.406	0.562
14	**350**	0.250	0.312	0.375	0.438	0.594
16	**400**	0.250	0.312	0.375	0.500	0.656
18	**450**	0.250	0.312	0.438	0.562	0.750
20	**500**	0.250	0.375	0.500	0.594	0.812
22	**550**	0.250	0.375	0.500	N/A	0.875
24	**600**	0.250	0.375	0.562	0.688	0.969
26	**650**	0.312	0.500	N/A	N/A	N/A
28	**700**	0.312	0.500	0.625	N/A	N/A
30	**750**	0.312	0.500	0.625	N/A	N/A
32	**800**	0.312	0.500	0.625	0.688	N/A
34	**850**	0.344	0.500	0.625	0.688	N/A
36	**900**	0.312	0.500	0.625	0.750	N/A
38	**950**	N/A	N/A	N/A	N/A	N/A
40	**1000**	N/A	N/A	N/A	N/A	N/A
42	**1050**	N/A	N/A	N/A	N/A	N/A
44	**1100**	N/A	N/A	N/A	N/A	N/A
46	**1150**	N/A	N/A	N/A	N/A	N/A
48	**1200**	N/A	N/A	N/A	N/A	N/A
52	**1300**	N/A	N/A	N/A	N/A	N/A

6.19M-1985 (SS)

Schedule versus Pipe ID (inches)

CARBON STEEL							
80	100	120	140	160	STD	XS	XXS
0.215	N/A	N/A	N/A	N/A	0.269	0.215	N/A
0.302	N/A	N/A	N/A	N/A	0.364	0.302	N/A
0.423	N/A	N/A	N/A	N/A	0.493	0.423	N/A
0.546	N/A	N/A	N/A	0.466	0.622	0.546	0.252
0.742	N/A	N/A	N/A	0.612	0.824	0.742	0.434
0.957	N/A	N/A	N/A	0.815	1.049	0.957	0.599
1.278	N/A	N/A	N/A	1.160	1.380	1.278	0.896
1.500	N/A	N/A	N/A	1.338	1.610	1.500	1.100
1.939	N/A	N/A	N/A	1.687	2.067	1.939	1.503
2.323	N/A	N/A	N/A	2.125	2.469	2.323	1.771
2.900	N/A	N/A	N/A	2.624	3.068	2.900	2.300
3.364	N/A	N/A	N/A	N/A	3.548	3.364	N/A
3.826	N/A	3.624	N/A	3.438	4.026	3.826	3.152
4.813	N/A	4.563	N/A	4.313	5.047	4.813	4.063
5.761	N/A	5.501	N/A	5.187	6.065	5.761	4.897
7.625	7.437	7.187	7.001	6.813	7.981	7.625	6.875
9.562	9.312	9.062	8.750	8.500	10.020	9.750	8.750
11.374	11.062	10.750	10.500	10.126	12.000	11.750	10.750
12.500	12.124	11.812	11.500	11.188	13.250	13.000	N/A
14.312	13.938	13.562	13.124	12.812	15.250	15.000	N/A
16.124	15.688	15.250	14.876	14.438	17.250	17.000	N/A
17.938	17.438	17.000	16.500	16.062	19.250	19.000	N/A
19.750	19.250	18.750	18.250	17.750	21.250	21.000	N/A
21.562	20.938	20.376	19.876	19.312	23.250	23.000	N/A
N/A	N/A	N/A	N/A	N/A	25.250	25.000	N/A
N/A	N/A	N/A	N/A	N/A	27.250	27.000	N/A
N/A	N/A	N/A	N/A	N/A	29.250	29.000	N/A
N/A	N/A	N/A	N/A	N/A	31.250	31.000	N/A
N/A	N/A	N/A	N/A	N/A	33.250	33.000	N/A
N/A	N/A	N/A	N/A	N/A	35.250	35.000	N/A
N/A	N/A	N/A	N/A	N/A	37.250	37.000	N/A
N/A	N/A	N/A	N/A	N/A	39.250	39.000	N/A
N/A	N/A	N/A	N/A	N/A	41.250	41.000	N/A
N/A	N/A	N/A	N/A	N/A	43.250	43.000	N/A
N/A	N/A	N/A	N/A	N/A	45.250	45.000	N/A
N/A	N/A	N/A	N/A	N/A	47.250	47.000	N/A
N/A	N/A	N/A	N/A	N/A	51.250	51.000	N/A

Schedule versus Wall Thickness (inches)

CARBON STEEL							
80	100	120	140	160	STD	XS	XXS
0.095	N/A	N/A	N/A	N/A	0.068	0.095	N/A
0.119	N/A	N/A	N/A	N/A	0.088	0.119	N/A
0.126	N/A	N/A	N/A	N/A	0.091	0.126	N/A
0.147	N/A	N/A	N/A	0.187	0.109	0.147	0.294
0.154	N/A	N/A	N/A	0.219	0.113	0.154	0.308
0.179	N/A	N/A	N/A	0.250	0.133	0.179	0.358
0.191	N/A	N/A	N/A	0.250	0.140	0.191	0.382
0.200	N/A	N/A	N/A	0.281	0.145	0.200	0.400
0.218	N/A	N/A	N/A	0.344	0.154	0.218	0.436
0.276	N/A	N/A	N/A	0.375	0.203	0.276	0.552
0.300	N/A	N/A	N/A	0.438	0.216	0.300	0.600
0.318	N/A	N/A	N/A	N/A	0.226	0.318	N/A

0.337	N/A	0.438	N/A	0.531	0.237	0.337	0.674
0.375	N/A	0.500	N/A	0.625	0.258	0.375	0.750
0.432	N/A	0.562	N/A	0.719	0.280	0.432	0.864
0.500	0.594	0.719	0.812	0.906	0.322	0.500	0.875
0.594	0.719	0.844	1.000	1.125	0.365	0.500	1.000
0.688	0.844	1.000	1.125	1.312	0.375	0.500	1.000
0.750	0.938	1.094	1.250	1.406	0.375	0.500	N/A
0.844	1.031	1.219	1.438	1.594	0.375	0.500	N/A
0.938	1.156	1.375	1.562	1.781	0.375	0.500	N/A
1.031	1.281	1.500	1.750	1.969	0.375	0.500	N/A
1.125	1.375	1.625	1.875	2.125	0.375	0.500	N/A
1.219	1.531	1.812	2.062	2.344	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A

STAINLESS STEEL			
5S	**10S**	**40S**	**80S**
N/A	0.307	0.269	0.215
N/A	0.410	0.364	0.302
N/A	0.545	0.493	0.423
0.710	0.674	0.622	0.546
0.920	0.884	0.824	0.742
1.185	1.094	1.049	0.957
1.530	1.442	1.380	1.278
1.770	1.682	1.610	1.500
2.245	2.157	2.067	1.939
2.709	2.635	2.469	2.323
3.334	3.260	3.068	2.900
3.834	3.760	3.548	3.364
4.334	4.260	4.026	3.826
5.345	5.295	5.047	4.813
6.407	6.375	6.065	5.761
8.407	8.329	7.981	7.625
10.482	10.420	10.020	9.750
12.438	12.390	12.000	11.750
13.688	13.624	N/A	N/A
15.670	15.624	N/A	N/A
17.670	17.624	N/A	N/A
19.624	19.564	N/A	N/A
21.624	21.564	N/A	N/A
23.564	23.500	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
29.500	29.376	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

STAINLESS STEEL			
5S	**10S**	**40S**	**80S**
N/A	0.049	0.068	0.095
N/A	0.065	0.088	0.119
N/A	0.065	0.091	0.126
0.065	0.083	0.109	0.147
0.065	0.083	0.113	0.154
0.065	0.109	0.133	0.179
0.065	0.109	0.140	0.191
0.065	0.109	0.145	0.200
0.065	0.109	0.154	0.218
0.083	0.120	0.203	0.276
0.083	0.120	0.216	0.300
0.083	0.120	0.226	0.318

0.083	0.120	0.237	0.337
0.109	0.134	0.258	0.375
0.109	0.134	0.280	0.432
0.109	0.148	0.322	0.500
0.134	0.165	0.365	0.500
0.156	0.180	0.375	0.500
0.156	0.188	N/A	N/A
0.165	0.188	N/A	N/A
0.165	0.188	N/A	N/A
0.188	0.218	N/A	N/A
0.188	0.218	N/A	N/A
0.218	0.250	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
0.250	0.312	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

Project Name : Binak compressor station
Item Name : Close Drain Pumps P-2202 A/B
Prepared by : M.Aryafar

PUMP CALCULATION

==========

OPERATING DATA

Temperature (°C)	5.0
Density @ Op. (Kg/m3)	980.0
Vapor pressure(Bar a)	1.00
Viscosity @ Op. (cP)	0.46
Normal capacity (m3/hr)	3.0
Dedign Factor %	10%
Design capacity (m3/hr)	3.3

SUCTION PRESSURE CALCULATION AT Qd

		Bar g	m
Min. liquid level in drum	1>>>>>		0.30
Max. liquid level in drum	2>>>>>		3.38
Bottom of drum Distanc from pump center line	3>>>>>		0.50
Total suction pressure drop in line & fittings	4>>>>>	-0.078	-0.81
Minimum Drum operating pressure	5>>>>>	0.2	2.1
Maximum Drum operating pressure		0.5	5.2
Min suction liquid pressure	1+3+4+5=6>>>>>	0.0	2.1
Drum DESIGN pressure	6*>>>>	9.00	
		Bar a	m
Absolute pressure	7>>>>>	1.030	-
Vapor pressure @ Op.	8>>>>>	1.00	-
Available NPSH	6-8+7=9>>>>>	0.03	0.3
Max required NPSH (by vendor)			

DISCHARGE PRESSURE CALCULATION AT Qd

		Bar g	m
Outlet pressure at injection point	10>>>>>	5.5	
Static head above pump axis	11>>>>>	0.73	7.6
Total discharge pressure drop in equipment	12>>>>>	0.0	
Total discharge pressure drop in line & fittings	13>>>>>	-0.05	
Calculated discharge pressure	10+11+12-13=14>>>>>	6.3	
Total discharge pressure	16+6>>>>>	7.0	

DIFFERENTIAL PRESSURE CALCULATION

		Bar	m
Differential pressure (at Qn)	14-6=15>>>>>	6.3	65.3
Estimated differential pressure (at Qn)	16≥15>>>>>	7.0	72.8

DESIGN PRESSURE ESTIMATION

		Bar g	m
Maximum suction pressure	17>>>>>	0.8	8
Differential pressure at Qd	16+6*=18>>>>>	16.0	
Pump design pressure (shut off pressure)	17+18=19>>>>>	16.8	

POWER CONSUMPTION ESTIMATION AT QD

Pump efficiency (Ep)	22%
Estimated hydraulic power @ Qd (KW)	0.6
Brake power (BHP) (hydraulic power/Ep)	2.9
Estimated efficiency of electro motor (EM)	-
Absorbed power (KW)	-

PRESSURE DROP CALCULATION

SUCTION PRESSURE DROP

Design capacity (m3/hr)	3.3	
Viscosity @ Op. (cP)	0.46	
Density @ Op. (Kg/m3)	980.0	
E (m)	0.000046	
Pipe size (in)	2.0	
SCH	STD	
Thk (in)	0.15	
ID (m)	0.05	
Velosity (m/s)	0.42	
Re	47800.1	
Friction factor (ſ)	0.02	
Pressure drop (bar/100m)	0.04	
Acceptable Pressure Drop (bar/100m)- Base on design criteria	0.35	**OK**
Acceptable Velosity (m/s)- Base on design criteria	0.90	**OK**
E/D	0.00088	
a	6.47763	
b	6.47773	
a-b	-0.00011	

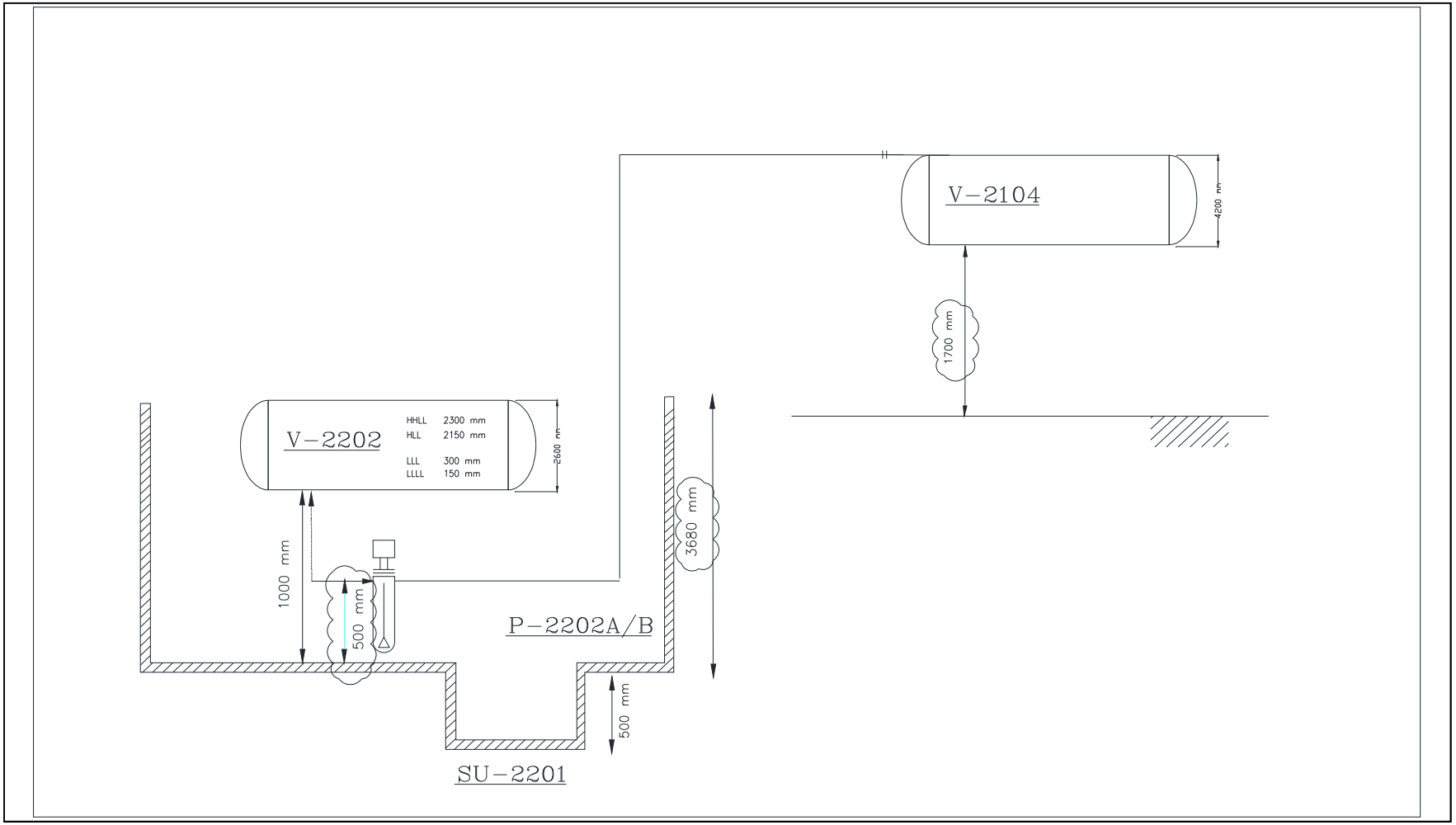
	L/D	No.	
Ball Valve Fully Open Conventional	13	1	0.7
Check Valve Fully Open	135	0	0.0
Tee with Flow Through branch	20	2	2.0
Elbow 90 Long Radius	13	3	2.0
Line lenght	-	-	15
Static Head		M	0.0
Total Equi. Length (m)			19.7
			Bar
Strainer		1	0.07
Total Equi. Length (Bar)			-0.008
Total Pressure Drop (Bar)			-0.078

DISCHARG LINE PRESSURE DROP

Design capacity (m3/hr)	3.3	
Viscosity @ Op. (cP)	0.46	
Density @ Op. (Kg/m3)	980.0	
E (m)	0.000046	
Pipe size (in)	2.0	
SCH	STD	
Thk (in)	0.15	
ID (m)	0.05	
Velosity (m/s)	0.42	
Re	47800.1	
Friction factor (ſ)	0.02383	
Pressure drop (bar/100m)	0.03992	
Acceptable Pressure Drop (bar/100m)- Base on design criteria	0.45	**OK**
Acceptable Velosity (m/s)- Base on design criteria	1.50	**OK**
E/D	0.00088	
a	6.47763	
b	6.47773	
a-b	-0.00011	

	L/D	No.	
Ball/Gate Valve Fully Open Convent	13	3	2.0
Check Valve Fully Open	135	1	6.9
Tee with Flow Through branch	60	4	12.2
Elbow 90 Long Radius	20	3	3.0
Line lenght	-	-	100
Static Head		M	0.0
Total Equi. Length (m)			124.1
Total Equi. Length (Bar)			-0.050
Total Pressure Drop (Bar)			-0.050

NOTES:


V-2104
4200 mm
1700 mm
V-2202
HHLL 2300 mm
HLL 2150 mm
LLL 300 mm
LLLL 150 mm
2600 mm
1000 mm
500 mm
3680 mm
P-2202A/B
500 mm
SU-2201

Data shown below: ANSI / ASME B36.10M-1996 (CS), ANSI / ASME B3

Nominal Size (incl	Nominal Size (mm)	10	20	30	40	60
0.125	3.13	N/A	N/A	N/A	0.269	N/A
0.25	6.25	N/A	N/A	N/A	0.364	N/A
0.375	9.39	N/A	N/A	N/A	0.493	N/A
0.5	12.5	N/A	N/A	N/A	0.622	N/A
0.75	18.75	N/A	N/A	N/A	0.824	N/A
1	25	N/A	N/A	N/A	1.049	N/A
1.25	31.75	N/A	N/A	N/A	1.380	N/A
1.5	37.5	N/A	N/A	N/A	1.610	N/A
2	50	N/A	N/A	N/A	2.067	N/A
2.5	62.5	N/A	N/A	N/A	2.469	N/A
3	75	N/A	N/A	N/A	3.068	N/A
3.5	87.5	N/A	N/A	N/A	3.548	N/A
4	100	N/A	N/A	N/A	4.026	N/A
5	125	N/A	N/A	N/A	5.047	N/A
6	150	N/A	N/A	N/A	6.065	N/A
8	200	N/A	8.125	8.071	7.981	7.813
10	250	N/A	10.250	10.136	10.020	9.750
12	300	N/A	12.250	12.090	11.938	11.626
14	350	13.500	13.376	13.250	13.124	12.812
16	400	15.500	15.376	15.250	15.000	14.688
18	450	17.500	17.376	17.124	16.876	16.500
20	500	19.500	19.250	19.000	18.812	18.376
22	550	21.500	21.250	21.000	N/A	20.250
24	600	23.500	23.250	22.876	22.624	22.062
26	650	25.376	25.000	N/A	N/A	N/A
28	700	27.376	27.000	26.750	N/A	N/A
30	750	29.376	29.000	28.750	N/A	N/A
32	800	31.376	31.000	30.750	30.624	N/A
34	850	33.312	33.000	32.750	32.624	N/A
36	900	35.376	35.000	34.750	34.500	N/A
38	950	N/A	N/A	N/A	N/A	N/A
40	1000	N/A	N/A	N/A	N/A	N/A
42	1050	N/A	N/A	N/A	N/A	N/A
44	1100	N/A	N/A	N/A	N/A	N/A
46	1150	N/A	N/A	N/A	N/A	N/A
48	1200	N/A	N/A	N/A	N/A	N/A
52	1300	N/A	N/A	N/A	N/A	N/A

Nominal Size (incl	Nominal Size (mm)	10	20	30	40	60
0.125	3.13	N/A	N/A	N/A	0.068	N/A
0.25	6.25	N/A	N/A	N/A	0.088	N/A
0.375	9.39	N/A	N/A	N/A	0.091	N/A
0.5	12.5	N/A	N/A	N/A	0.109	N/A
0.75	18.75	N/A	N/A	N/A	0.113	N/A
1	25	N/A	N/A	N/A	0.133	N/A
1.25	31.75	N/A	N/A	N/A	0.140	N/A
1.5	37.5	N/A	N/A	N/A	0.145	N/A
2	50	N/A	N/A	N/A	0.154	N/A
2.5	62.5	N/A	N/A	N/A	0.203	N/A
3	75	N/A	N/A	N/A	0.216	N/A
3.5	87.5	N/A	N/A	N/A	0.226	N/A

4	**100**	N/A	N/A	N/A	0.237	N/A
5	**125**	N/A	N/A	N/A	0.258	N/A
6	**150**	N/A	N/A	N/A	0.280	N/A
8	**200**	N/A	0.250	0.277	0.322	0.406
10	**250**	N/A	0.250	0.307	0.365	0.500
12	**300**	N/A	0.250	0.330	0.406	0.562
14	**350**	0.250	0.312	0.375	0.438	0.594
16	**400**	0.250	0.312	0.375	0.500	0.656
18	**450**	0.250	0.312	0.438	0.562	0.750
20	**500**	0.250	0.375	0.500	0.594	0.812
22	**550**	0.250	0.375	0.500	N/A	0.875
24	**600**	0.250	0.375	0.562	0.688	0.969
26	**650**	0.312	0.500	N/A	N/A	N/A
28	**700**	0.312	0.500	0.625	N/A	N/A
30	**750**	0.312	0.500	0.625	N/A	N/A
32	**800**	0.312	0.500	0.625	0.688	N/A
34	**850**	0.344	0.500	0.625	0.688	N/A
36	**900**	0.312	0.500	0.625	0.750	N/A
38	**950**	N/A	N/A	N/A	N/A	N/A
40	**1000**	N/A	N/A	N/A	N/A	N/A
42	**1050**	N/A	N/A	N/A	N/A	N/A
44	**1100**	N/A	N/A	N/A	N/A	N/A
46	**1150**	N/A	N/A	N/A	N/A	N/A
48	**1200**	N/A	N/A	N/A	N/A	N/A
52	**1300**	N/A	N/A	N/A	N/A	N/A

6.19M-1985 (SS)

Schedule versus Pipe ID (inches)

CARBON STEEL							
80	100	120	140	160	STD	XS	XXS
0.215	N/A	N/A	N/A	N/A	0.269	0.215	N/A
0.302	N/A	N/A	N/A	N/A	0.364	0.302	N/A
0.423	N/A	N/A	N/A	N/A	0.493	0.423	N/A
0.546	N/A	N/A	N/A	0.466	0.622	0.546	0.252
0.742	N/A	N/A	N/A	0.612	0.824	0.742	0.434
0.957	N/A	N/A	N/A	0.815	1.049	0.957	0.599
1.278	N/A	N/A	N/A	1.160	1.380	1.278	0.896
1.500	N/A	N/A	N/A	1.338	1.610	1.500	1.100
1.939	N/A	N/A	N/A	1.687	2.067	1.939	1.503
2.323	N/A	N/A	N/A	2.125	2.469	2.323	1.771
2.900	N/A	N/A	N/A	2.624	3.068	2.900	2.300
3.364	N/A	N/A	N/A	N/A	3.548	3.364	N/A
3.826	N/A	3.624	N/A	3.438	4.026	3.826	3.152
4.813	N/A	4.563	N/A	4.313	5.047	4.813	4.063
5.761	N/A	5.501	N/A	5.187	6.065	5.761	4.897
7.625	7.437	7.187	7.001	6.813	7.981	7.625	6.875
9.562	9.312	9.062	8.750	8.500	10.020	9.750	8.750
11.374	11.062	10.750	10.500	10.126	12.000	11.750	10.750
12.500	12.124	11.812	11.500	11.188	13.250	13.000	N/A
14.312	13.938	13.562	13.124	12.812	15.250	15.000	N/A
16.124	15.688	15.250	14.876	14.438	17.250	17.000	N/A
17.938	17.438	17.000	16.500	16.062	19.250	19.000	N/A
19.750	19.250	18.750	18.250	17.750	21.250	21.000	N/A
21.562	20.938	20.376	19.876	19.312	23.250	23.000	N/A
N/A	N/A	N/A	N/A	N/A	25.250	25.000	N/A
N/A	N/A	N/A	N/A	N/A	27.250	27.000	N/A
N/A	N/A	N/A	N/A	N/A	29.250	29.000	N/A
N/A	N/A	N/A	N/A	N/A	31.250	31.000	N/A
N/A	N/A	N/A	N/A	N/A	33.250	33.000	N/A
N/A	N/A	N/A	N/A	N/A	35.250	35.000	N/A
N/A	N/A	N/A	N/A	N/A	37.250	37.000	N/A
N/A	N/A	N/A	N/A	N/A	39.250	39.000	N/A
N/A	N/A	N/A	N/A	N/A	41.250	41.000	N/A
N/A	N/A	N/A	N/A	N/A	43.250	43.000	N/A
N/A	N/A	N/A	N/A	N/A	45.250	45.000	N/A
N/A	N/A	N/A	N/A	N/A	47.250	47.000	N/A
N/A	N/A	N/A	N/A	N/A	51.250	51.000	N/A

Schedule versus Wall Thickness (inches)

CARBON STEEL							
80	100	120	140	160	STD	XS	XXS
0.095	N/A	N/A	N/A	N/A	0.068	0.095	N/A
0.119	N/A	N/A	N/A	N/A	0.088	0.119	N/A
0.126	N/A	N/A	N/A	N/A	0.091	0.126	N/A
0.147	N/A	N/A	N/A	0.187	0.109	0.147	0.294
0.154	N/A	N/A	N/A	0.219	0.113	0.154	0.308
0.179	N/A	N/A	N/A	0.250	0.133	0.179	0.358
0.191	N/A	N/A	N/A	0.250	0.140	0.191	0.382
0.200	N/A	N/A	N/A	0.281	0.145	0.200	0.400
0.218	N/A	N/A	N/A	0.344	0.154	0.218	0.436
0.276	N/A	N/A	N/A	0.375	0.203	0.276	0.552
0.300	N/A	N/A	N/A	0.438	0.216	0.300	0.600
0.318	N/A	N/A	N/A	N/A	0.226	0.318	N/A

0.337	N/A	0.438	N/A	0.531	0.237	0.337	0.674
0.375	N/A	0.500	N/A	0.625	0.258	0.375	0.750
0.432	N/A	0.562	N/A	0.719	0.280	0.432	0.864
0.500	0.594	0.719	0.812	0.906	0.322	0.500	0.875
0.594	0.719	0.844	1.000	1.125	0.365	0.500	1.000
0.688	0.844	1.000	1.125	1.312	0.375	0.500	1.000
0.750	0.938	1.094	1.250	1.406	0.375	0.500	N/A
0.844	1.031	1.219	1.438	1.594	0.375	0.500	N/A
0.938	1.156	1.375	1.562	1.781	0.375	0.500	N/A
1.031	1.281	1.500	1.750	1.969	0.375	0.500	N/A
1.125	1.375	1.625	1.875	2.125	0.375	0.500	N/A
1.219	1.531	1.812	2.062	2.344	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A

STAINLESS STEEL			
5S	**10S**	**40S**	**80S**
N/A	0.307	0.269	0.215
N/A	0.410	0.364	0.302
N/A	0.545	0.493	0.423
0.710	0.674	0.622	0.546
0.920	0.884	0.824	0.742
1.185	1.094	1.049	0.957
1.530	1.442	1.380	1.278
1.770	1.682	1.610	1.500
2.245	2.157	2.067	1.939
2.709	2.635	2.469	2.323
3.334	3.260	3.068	2.900
3.834	3.760	3.548	3.364
4.334	4.260	4.026	3.826
5.345	5.295	5.047	4.813
6.407	6.375	6.065	5.761
8.407	8.329	7.981	7.625
10.482	10.420	10.020	9.750
12.438	12.390	12.000	11.750
13.688	13.624	N/A	N/A
15.670	15.624	N/A	N/A
17.670	17.624	N/A	N/A
19.624	19.564	N/A	N/A
21.624	21.564	N/A	N/A
23.564	23.500	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
29.500	29.376	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

STAINLESS STEEL			
5S	**10S**	**40S**	**80S**
N/A	0.049	0.068	0.095
N/A	0.065	0.088	0.119
N/A	0.065	0.091	0.126
0.065	0.083	0.109	0.147
0.065	0.083	0.113	0.154
0.065	0.109	0.133	0.179
0.065	0.109	0.140	0.191
0.065	0.109	0.145	0.200
0.065	0.109	0.154	0.218
0.083	0.120	0.203	0.276
0.083	0.120	0.216	0.300
0.083	0.120	0.226	0.318

0.083	0.120	0.237	0.337
0.109	0.134	0.258	0.375
0.109	0.134	0.280	0.432
0.109	0.148	0.322	0.500
0.134	0.165	0.365	0.500
0.156	0.180	0.375	0.500
0.156	0.188	N/A	N/A
0.165	0.188	N/A	N/A
0.165	0.188	N/A	N/A
0.188	0.218	N/A	N/A
0.188	0.218	N/A	N/A
0.218	0.250	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
0.250	0.312	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

Project Name : Binak compressor station
Item Name : Sump Pumps P-2203 A/B
Prepared by : M.Aryafar

PUMP CALCULATION

OPERATING DATA

Temperature (°C)	5.0
Density @ Op. (Kg/m3)	1024
Vapor pressure @ Op.(Bar a)	0.110
Viscosity @ Op. (cP)	0.55
Normal capacity (m3/hr)	5.0
Design Factor %	10%
Design capacity (m3/hr)	5.5

SUCTION PRESSURE CALCULATION AT Qd

		Bar g	m
Min. liquid level	1>>>>>		0.10
Max. liquid level	2>>>>>		0.50
Defrent level pump nozzle and suction point	3>>>>>		0.1
Total suction pressure drop in line & fittings	4>>>>>	-	-
Drum operating pressure	5>>>>>	0.0	0.0
Min suction liquid pressure	1+3+4+5=6>>>>>	0.02	0.2

		Bar a	m
Absolute pressure	7>>>>>	1.030	-
Vapor pressure @ Op.	8>>>>>	0.11	-
Available NPSH	6-8+7=9>>>>>	0.940	9.4
Max required NPSH (by vendor)			

DISCHARGE PRESSURE CALCULATION AT Qd

		Bar g	m
Outlet pressure at injection point	10>>>>>	0.5	
Static head above pump axis	11>>>>>	0.4	4.1
Total discharge pressure drop in equipment	12>>>>>	0.0	
Total discharge pressure drop in line & fittings	13>>>>>	-0.070	
Calculated discharge pressure	10+11+12-13=14>>>>>	1.0	
Total discharge pressure	16+6>>>>>	2.0	

DIFFERENTIAL PRESSURE CALCULATION

		Bar	m
Differential pressure (at Qn)	14-6=15>>>>>	1.0	9.6
Estimated differential pressure (at Qn)	16≥15	2.0	19.9

DESIGN PRESSURE ESTIMATION

		Bar g	m
Maximum suction pressure	16>>>>>	0.1	1
20% of differential pressure at Qd	1.2X15=17>>>>>	2.4	
Pump design pressure (shut off pressure)	16+17=18>>>>>	2.5	

POWER CONSUMPTION ESTIMATION AT QD

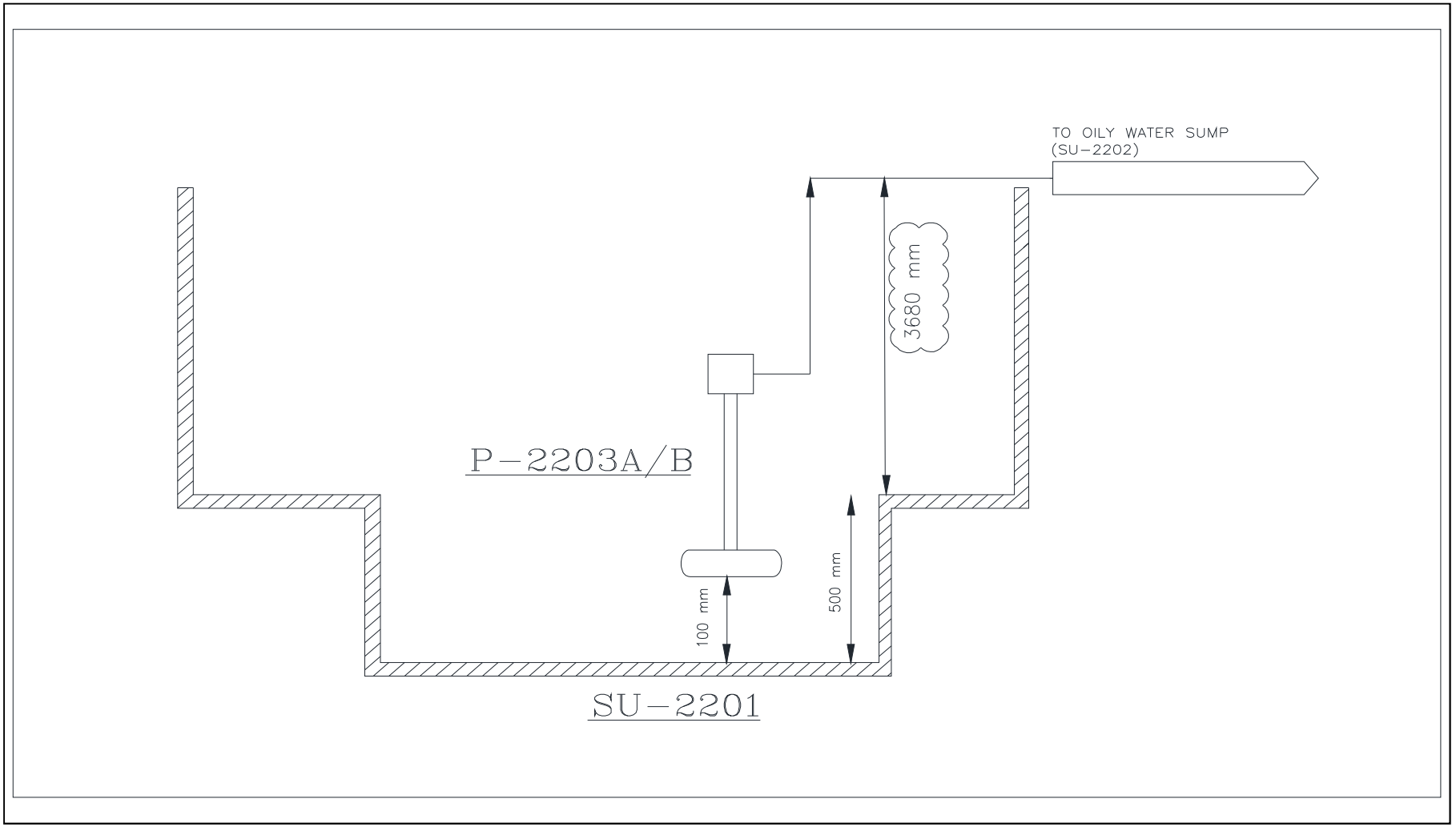
Pump efficiency (Ep)	31%
Estimated hydraulic power @ Qd (KW)	0.31
Brake power (BHP) (hydraulic power/Ep)	0.99
Estimated efficiency of electro motor (EM)	-
Absorbed power (KW)	-

PRESSURE DROP CALCULATION

DISCHARG LINE PRESSURE DROP

Design capacity (m3/hr)	5.5	
Viscosity @ Op. (cP)	0.55	
Density @ Op. (Kg/m3)	1024.0	
E (m)	0.000046	
Pipe size (in)	2.0	
SCH	40.0	
Thk (in)	0.15	
ID (m)	0.05	
Velosity (m/s)	0.71	
Re	69016.6	
Friction factor (ƒ)	0.02267	
Pressure drop (bar/100m)	0.11023	
Acceptable Pressure Drop (bar/100m)- Base on design criteria	0.45	**OK**
Acceptable Velosity (m/s)- Base on design criteria	1.50	**OK**
E/D	0.00088	
a	6.64103	
b	6.64056	
a-b	0.00047	

	L/D	No.	
Ball/Gate Valve Fully Open Convent	13	1	0.7
Check Valve Fully Open	135	1	6.9
Tee with Flow Through branch	60	1	3.0
Elbow 90 Long Radius	20	3	3.0
Line lenght	-	-	50
Static Head		M	0.0
Total Equi. Length (m)			63.6
			-0.070
Total Pressure Drop (Bar)			-0.070


TO OILY WATER SUMP
(SU-2202)
3680 mm
P-2203A/B
500 mm
100 mm
SU-2201

Data shown below: ANSI / ASME B36.10M-1996 (CS), ANSI / ASME B3

Nominal Size (incl	Nominal Size (mm)	10	20	30	40	60
0.125	3.13	N/A	N/A	N/A	0.269	N/A
0.25	6.25	N/A	N/A	N/A	0.364	N/A
0.375	9.39	N/A	N/A	N/A	0.493	N/A
0.5	12.5	N/A	N/A	N/A	0.622	N/A
0.75	18.75	N/A	N/A	N/A	0.824	N/A
1	25	N/A	N/A	N/A	1.049	N/A
1.25	31.75	N/A	N/A	N/A	1.380	N/A
1.5	37.5	N/A	N/A	N/A	1.610	N/A
2	50	N/A	N/A	N/A	2.067	N/A
2.5	62.5	N/A	N/A	N/A	2.469	N/A
3	75	N/A	N/A	N/A	3.068	N/A
3.5	87.5	N/A	N/A	N/A	3.548	N/A
4	100	N/A	N/A	N/A	4.026	N/A
5	125	N/A	N/A	N/A	5.047	N/A
6	150	N/A	N/A	N/A	6.065	N/A
8	200	N/A	8.125	8.071	7.981	7.813
10	250	N/A	10.250	10.136	10.020	9.750
12	300	N/A	12.250	12.090	11.938	11.626
14	350	13.500	13.376	13.250	13.124	12.812
16	400	15.500	15.376	15.250	15.000	14.688
18	450	17.500	17.376	17.124	16.876	16.500
20	500	19.500	19.250	19.000	18.812	18.376
22	550	21.500	21.250	21.000	N/A	20.250
24	600	23.500	23.250	22.876	22.624	22.062
26	650	25.376	25.000	N/A	N/A	N/A
28	700	27.376	27.000	26.750	N/A	N/A
30	750	29.376	29.000	28.750	N/A	N/A
32	800	31.376	31.000	30.750	30.624	N/A
34	850	33.312	33.000	32.750	32.624	N/A
36	900	35.376	35.000	34.750	34.500	N/A
38	950	N/A	N/A	N/A	N/A	N/A
40	1000	N/A	N/A	N/A	N/A	N/A
42	1050	N/A	N/A	N/A	N/A	N/A
44	1100	N/A	N/A	N/A	N/A	N/A
46	1150	N/A	N/A	N/A	N/A	N/A
48	1200	N/A	N/A	N/A	N/A	N/A
52	1300	N/A	N/A	N/A	N/A	N/A

Nominal Size (incl	Nominal Size (mm)	10	20	30	40	60
0.125	3.13	N/A	N/A	N/A	0.068	N/A
0.25	6.25	N/A	N/A	N/A	0.088	N/A
0.375	9.39	N/A	N/A	N/A	0.091	N/A
0.5	12.5	N/A	N/A	N/A	0.109	N/A
0.75	18.75	N/A	N/A	N/A	0.113	N/A
1	25	N/A	N/A	N/A	0.133	N/A
1.25	31.75	N/A	N/A	N/A	0.140	N/A
1.5	37.5	N/A	N/A	N/A	0.145	N/A
2	50	N/A	N/A	N/A	0.154	N/A
2.5	62.5	N/A	N/A	N/A	0.203	N/A
3	75	N/A	N/A	N/A	0.216	N/A
3.5	87.5	N/A	N/A	N/A	0.226	N/A

4	**100**	N/A	N/A	N/A	0.237	N/A
5	**125**	N/A	N/A	N/A	0.258	N/A
6	**150**	N/A	N/A	N/A	0.280	N/A
8	**200**	N/A	0.250	0.277	0.322	0.406
10	**250**	N/A	0.250	0.307	0.365	0.500
12	**300**	N/A	0.250	0.330	0.406	0.562
14	**350**	0.250	0.312	0.375	0.438	0.594
16	**400**	0.250	0.312	0.375	0.500	0.656
18	**450**	0.250	0.312	0.438	0.562	0.750
20	**500**	0.250	0.375	0.500	0.594	0.812
22	**550**	0.250	0.375	0.500	N/A	0.875
24	**600**	0.250	0.375	0.562	0.688	0.969
26	**650**	0.312	0.500	N/A	N/A	N/A
28	**700**	0.312	0.500	0.625	N/A	N/A
30	**750**	0.312	0.500	0.625	N/A	N/A
32	**800**	0.312	0.500	0.625	0.688	N/A
34	**850**	0.344	0.500	0.625	0.688	N/A
36	**900**	0.312	0.500	0.625	0.750	N/A
38	**950**	N/A	N/A	N/A	N/A	N/A
40	**1000**	N/A	N/A	N/A	N/A	N/A
42	**1050**	N/A	N/A	N/A	N/A	N/A
44	**1100**	N/A	N/A	N/A	N/A	N/A
46	**1150**	N/A	N/A	N/A	N/A	N/A
48	**1200**	N/A	N/A	N/A	N/A	N/A
52	**1300**	N/A	N/A	N/A	N/A	N/A

6.19M-1985 (SS)

Schedule versus Pipe ID (inches)

CARBON STEEL							
80	100	120	140	160	STD	XS	XXS
0.215	N/A	N/A	N/A	N/A	0.269	0.215	N/A
0.302	N/A	N/A	N/A	N/A	0.364	0.302	N/A
0.423	N/A	N/A	N/A	N/A	0.493	0.423	N/A
0.546	N/A	N/A	N/A	0.466	0.622	0.546	0.252
0.742	N/A	N/A	N/A	0.612	0.824	0.742	0.434
0.957	N/A	N/A	N/A	0.815	1.049	0.957	0.599
1.278	N/A	N/A	N/A	1.160	1.380	1.278	0.896
1.500	N/A	N/A	N/A	1.338	1.610	1.500	1.100
1.939	N/A	N/A	N/A	1.687	2.067	1.939	1.503
2.323	N/A	N/A	N/A	2.125	2.469	2.323	1.771
2.900	N/A	N/A	N/A	2.624	3.068	2.900	2.300
3.364	N/A	N/A	N/A	N/A	3.548	3.364	N/A
3.826	N/A	3.624	N/A	3.438	4.026	3.826	3.152
4.813	N/A	4.563	N/A	4.313	5.047	4.813	4.063
5.761	N/A	5.501	N/A	5.187	6.065	5.761	4.897
7.625	7.437	7.187	7.001	6.813	7.981	7.625	6.875
9.562	9.312	9.062	8.750	8.500	10.020	9.750	8.750
11.374	11.062	10.750	10.500	10.126	12.000	11.750	10.750
12.500	12.124	11.812	11.500	11.188	13.250	13.000	N/A
14.312	13.938	13.562	13.124	12.812	15.250	15.000	N/A
16.124	15.688	15.250	14.876	14.438	17.250	17.000	N/A
17.938	17.438	17.000	16.500	16.062	19.250	19.000	N/A
19.750	19.250	18.750	18.250	17.750	21.250	21.000	N/A
21.562	20.938	20.376	19.876	19.312	23.250	23.000	N/A
N/A	N/A	N/A	N/A	N/A	25.250	25.000	N/A
N/A	N/A	N/A	N/A	N/A	27.250	27.000	N/A
N/A	N/A	N/A	N/A	N/A	29.250	29.000	N/A
N/A	N/A	N/A	N/A	N/A	31.250	31.000	N/A
N/A	N/A	N/A	N/A	N/A	33.250	33.000	N/A
N/A	N/A	N/A	N/A	N/A	35.250	35.000	N/A
N/A	N/A	N/A	N/A	N/A	37.250	37.000	N/A
N/A	N/A	N/A	N/A	N/A	39.250	39.000	N/A
N/A	N/A	N/A	N/A	N/A	41.250	41.000	N/A
N/A	N/A	N/A	N/A	N/A	43.250	43.000	N/A
N/A	N/A	N/A	N/A	N/A	45.250	45.000	N/A
N/A	N/A	N/A	N/A	N/A	47.250	47.000	N/A
N/A	N/A	N/A	N/A	N/A	51.250	51.000	N/A

Schedule versus Wall Thickness (inches)

CARBON STEEL							
80	100	120	140	160	STD	XS	XXS
0.095	N/A	N/A	N/A	N/A	0.068	0.095	N/A
0.119	N/A	N/A	N/A	N/A	0.088	0.119	N/A
0.126	N/A	N/A	N/A	N/A	0.091	0.126	N/A
0.147	N/A	N/A	N/A	0.187	0.109	0.147	0.294
0.154	N/A	N/A	N/A	0.219	0.113	0.154	0.308
0.179	N/A	N/A	N/A	0.250	0.133	0.179	0.358
0.191	N/A	N/A	N/A	0.250	0.140	0.191	0.382
0.200	N/A	N/A	N/A	0.281	0.145	0.200	0.400
0.218	N/A	N/A	N/A	0.344	0.154	0.218	0.436
0.276	N/A	N/A	N/A	0.375	0.203	0.276	0.552
0.300	N/A	N/A	N/A	0.438	0.216	0.300	0.600
0.318	N/A	N/A	N/A	N/A	0.226	0.318	N/A

0.337	N/A	0.438	N/A	0.531	0.237	0.337	0.674
0.375	N/A	0.500	N/A	0.625	0.258	0.375	0.750
0.432	N/A	0.562	N/A	0.719	0.280	0.432	0.864
0.500	0.594	0.719	0.812	0.906	0.322	0.500	0.875
0.594	0.719	0.844	1.000	1.125	0.365	0.500	1.000
0.688	0.844	1.000	1.125	1.312	0.375	0.500	1.000
0.750	0.938	1.094	1.250	1.406	0.375	0.500	N/A
0.844	1.031	1.219	1.438	1.594	0.375	0.500	N/A
0.938	1.156	1.375	1.562	1.781	0.375	0.500	N/A
1.031	1.281	1.500	1.750	1.969	0.375	0.500	N/A
1.125	1.375	1.625	1.875	2.125	0.375	0.500	N/A
1.219	1.531	1.812	2.062	2.344	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A

STAINLESS STEEL			
5S	**10S**	**40S**	**80S**
N/A	0.307	0.269	0.215
N/A	0.410	0.364	0.302
N/A	0.545	0.493	0.423
0.710	0.674	0.622	0.546
0.920	0.884	0.824	0.742
1.185	1.094	1.049	0.957
1.530	1.442	1.380	1.278
1.770	1.682	1.610	1.500
2.245	2.157	2.067	1.939
2.709	2.635	2.469	2.323
3.334	3.260	3.068	2.900
3.834	3.760	3.548	3.364
4.334	4.260	4.026	3.826
5.345	5.295	5.047	4.813
6.407	6.375	6.065	5.761
8.407	8.329	7.981	7.625
10.482	10.420	10.020	9.750
12.438	12.390	12.000	11.750
13.688	13.624	N/A	N/A
15.670	15.624	N/A	N/A
17.670	17.624	N/A	N/A
19.624	19.564	N/A	N/A
21.624	21.564	N/A	N/A
23.564	23.500	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
29.500	29.376	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

STAINLESS STEEL			
5S	**10S**	**40S**	**80S**
N/A	0.049	0.068	0.095
N/A	0.065	0.088	0.119
N/A	0.065	0.091	0.126
0.065	0.083	0.109	0.147
0.065	0.083	0.113	0.154
0.065	0.109	0.133	0.179
0.065	0.109	0.140	0.191
0.065	0.109	0.145	0.200
0.065	0.109	0.154	0.218
0.083	0.120	0.203	0.276
0.083	0.120	0.216	0.300
0.083	0.120	0.226	0.318

0.083	0.120	0.237	0.337
0.109	0.134	0.258	0.375
0.109	0.134	0.280	0.432
0.109	0.148	0.322	0.500
0.134	0.165	0.365	0.500
0.156	0.180	0.375	0.500
0.156	0.188	N/A	N/A
0.165	0.188	N/A	N/A
0.165	0.188	N/A	N/A
0.188	0.218	N/A	N/A
0.188	0.218	N/A	N/A
0.218	0.250	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
0.250	0.312	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

Project Name : Binak compressor station
Item Name : Diesel Pump P-2206
Prepared by : M.Aryafar

PUMP CALCULATION

OPERATING DATA

Temperature (°C)	Amb.
Density @ Op. (Kg/m3)	850
Vapor pressure @ Op.(Bar a)	0.130
Viscosity @ Op. (cP)	4.80
Normal capacity (m3/hr)	5.0
Dedign Factor %	10%
Design capacity (m3/hr)	5.5

SUCTION PRESSURE CALCULATION AT Qd

		Bar g	m
Min. liquid level in drum (Truck)	1>>>>>		0.00
Max. liquid level in drum (Truck)	2>>>>>		2.00
Bottom of drum (Truck) Distanc from pump center line	3>>>>>		0.50
Total suction pressure drop in line & fittings	4>>>>>	-0.102	-1.23
Drum O.P pressure	5>>>>>	0.0	0.0
Min suction liquid pressure	1+3+4+5=6>>>>>	-0.06	-0.7
Drum Design Pressure	6*	1.00	
		Bar a	m
Absolute pressure	7>>>>>	1.013	-
Vapor pressure @ Op.	8>>>>>	0.13	-
Available NPSH	6-8+7=9>>>>>	0.82	9.9
Max required NPSH (by vendor)			

DISCHARGE PRESSURE CALCULATION AT Qd

		Bar g	m
Outlet pressure at injection point	10>>>>>	0.5	
Static head above pump axis	11>>>>>	0.4	4.5
Total discharge pressure drop in equipment	12>>>>>	0.0	
Total discharge pressure drop in line & fittings	13>>>>>	-0.07	
Calculated discharge pressure	10+11+12-13=14>>>>>	1.0	
Total discharge pressure	16+6>>>>>	0.94	

DIFFERENTIAL PRESSURE CALCULATION

		Bar	m
Differential pressure (at Qn)	14-6=15>>>>>	1.01	12.1
Estimated differential pressure (at Qn)	16≥15	1.0	12.0

DESIGN PRESSURE ESTIMATION

		Bar g	m
Maximum suction pressure	17>>>>>	0.11	1
Differential pressure at Qd	16+6*=18>>>>>	2.0	
Pump design pressure (shut off pressure)	17+18=19>>>>>	2.1	

POWER CONSUMPTION ESTIMATION AT QD

Pump efficiency (Ep)	52%
Estimated hydraulic power @ Qd (KW)	0.2
Brake power (BHP) (hydraulic power/Ep)	0.3
Estimated efficiency of electro motor (EM)	-
Absorbed power (KW)	-

PRESSURE DROP CALCULATION

SUCTION PRESSURE DROP

Design capacity (m3/hr)	5.5	
Viscosity @ Op. (cP)	4.80	
Density @ Op. (Kg/m3)	850.0	
E (m)	0.000046	
Pipe size (in)	2.0	
SCH	STD	
Thk (in)	0.15	
ID (m)	0.05	
Velosity (m/s)	0.71	
Re	6564.4	
Friction factor (f)	0.04	
Pressure drop (bar/100m)	0.14410	
Acceptable Pressure Drop (bar/100m)- Base on design criteria	0.35	**OK**
Acceptable Velosity (m/s)- Base on design criteria	0.90	**OK**
E/D	0.00088	
a	5.29194	
b	5.29168	
a-b	0.00026	

	L/D	No.	
Ball/Gate Valve Fully Open Conventional	13	2	1.3
Check Valve Fully Open	135	1	6.9
Tee with Flow Through branch	20	3	3.0
Elbow 90 Long Radius	13	2	1.3
Line lenght	-	-	10
Static Head		M	0.0
Total Equi. Length (m)			22.5
			Bar
Strainer		1	0.07
Total Equi. Length (Bar)			-0.032
Total Pressure Drop (Bar)			-0.102

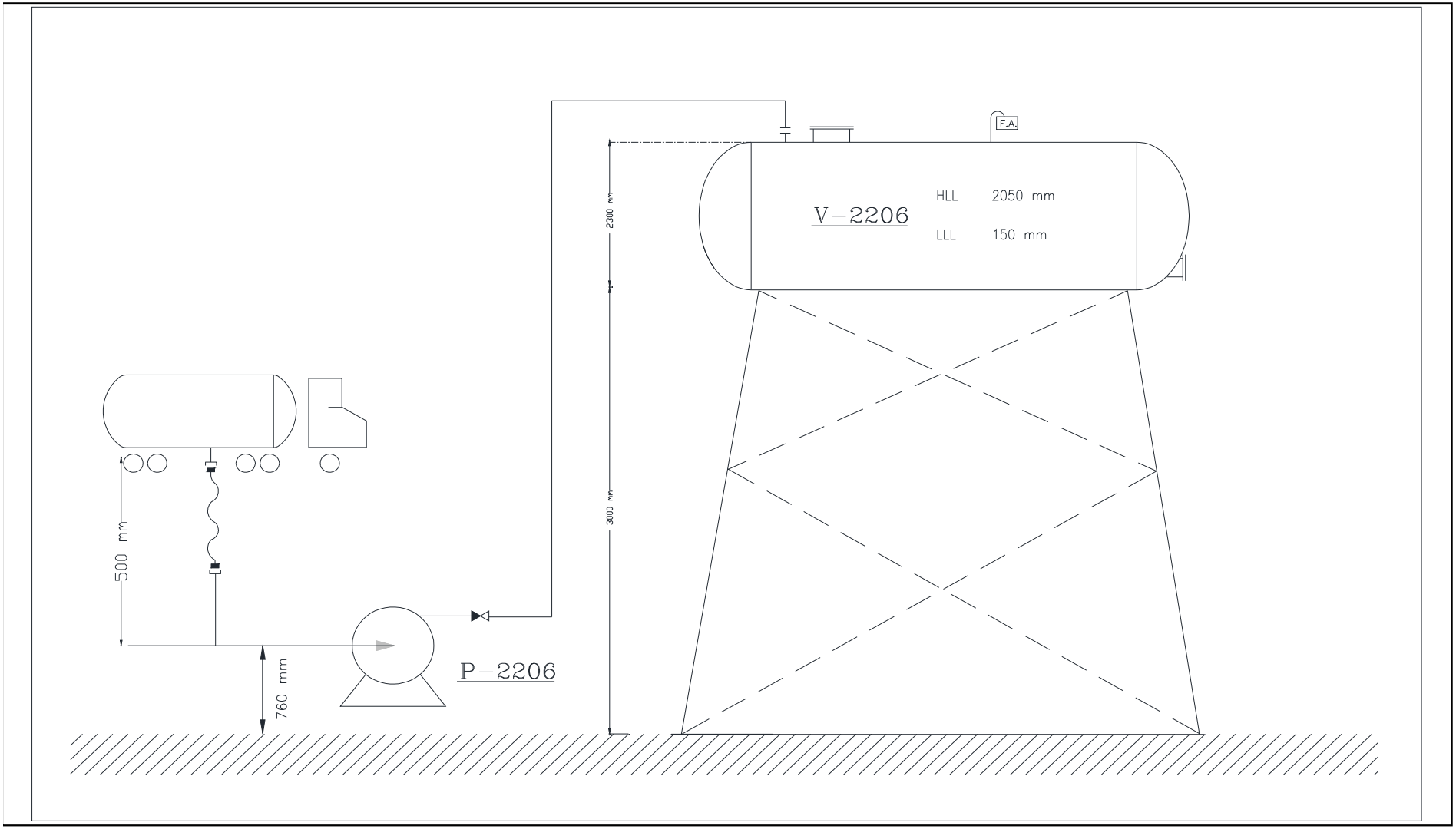
DISCHARG LINE PRESSURE DROP

Design capacity (m3/hr)	5.5	
Viscosity @ Op. (cP)	4.80	
Density @ Op. (Kg/m3)	850.0	
E (m)	0.000046	
Pipe size (in)	2.0	
SCH	40.0	
Thk (in)	0.15	
ID (m)	0.05	
Velosity (m/s)	0.71	
Re	6564.4	
Friction factor (ƒ)	0.03571	
Pressure drop (bar/100m)	0.14410	
Acceptable Pressure Drop (bar/100m)- Base on design criteria	0.45	**OK**
Acceptable Velosity (m/s)- Base on design criteria	1.50	**OK**
E/D	0.00088	
a	5.29194	
b	5.29168	
a-b	0.00026	

	L/D	No.	
Ball/Gate Valve Fully Open Conventional	13	3	2.0
Check Valve Fully Open	135	1	6.9
Tee with Flow Through branch	60	5	15.2
Elbow 90 Long Radius	20	6	6.1
Line lenght	-	-	20
Static Head		M	0.0

Total Equi. Length (m)	50.2
Total Equi. Length (Bar)	-0.072
Total Pressure Drop (Bar)	-0.072

NOTES:


F.A.
V-2206
HLL 2050 mm
LLL 150 mm
2300 mm
3000 mm
500 mm
760 mm
P-2206

Data shown below: ANSI / ASME B36.10M-1996 (CS), ANSI / ASME B3

Nominal Size (incl	Nominal Size (mm)	10	20	30	40	60
0.125	3.13	N/A	N/A	N/A	0.269	N/A
0.25	6.25	N/A	N/A	N/A	0.364	N/A
0.375	9.39	N/A	N/A	N/A	0.493	N/A
0.5	12.5	N/A	N/A	N/A	0.622	N/A
0.75	18.75	N/A	N/A	N/A	0.824	N/A
1	25	N/A	N/A	N/A	1.049	N/A
1.25	31.75	N/A	N/A	N/A	1.380	N/A
1.5	37.5	N/A	N/A	N/A	1.610	N/A
2	50	N/A	N/A	N/A	2.067	N/A
2.5	62.5	N/A	N/A	N/A	2.469	N/A
3	75	N/A	N/A	N/A	3.068	N/A
3.5	87.5	N/A	N/A	N/A	3.548	N/A
4	100	N/A	N/A	N/A	4.026	N/A
5	125	N/A	N/A	N/A	5.047	N/A
6	150	N/A	N/A	N/A	6.065	N/A
8	200	N/A	8.125	8.071	7.981	7.813
10	250	N/A	10.250	10.136	10.020	9.750
12	300	N/A	12.250	12.090	11.938	11.626
14	350	13.500	13.376	13.250	13.124	12.812
16	400	15.500	15.376	15.250	15.000	14.688
18	450	17.500	17.376	17.124	16.876	16.500
20	500	19.500	19.250	19.000	18.812	18.376
22	550	21.500	21.250	21.000	N/A	20.250
24	600	23.500	23.250	22.876	22.624	22.062
26	650	25.376	25.000	N/A	N/A	N/A
28	700	27.376	27.000	26.750	N/A	N/A
30	750	29.376	29.000	28.750	N/A	N/A
32	800	31.376	31.000	30.750	30.624	N/A
34	850	33.312	33.000	32.750	32.624	N/A
36	900	35.376	35.000	34.750	34.500	N/A
38	950	N/A	N/A	N/A	N/A	N/A
40	1000	N/A	N/A	N/A	N/A	N/A
42	1050	N/A	N/A	N/A	N/A	N/A
44	1100	N/A	N/A	N/A	N/A	N/A
46	1150	N/A	N/A	N/A	N/A	N/A
48	1200	N/A	N/A	N/A	N/A	N/A
52	1300	N/A	N/A	N/A	N/A	N/A

Nominal Size (incl	Nominal Size (mm)	10	20	30	40	60
0.125	3.13	N/A	N/A	N/A	0.068	N/A
0.25	6.25	N/A	N/A	N/A	0.088	N/A
0.375	9.39	N/A	N/A	N/A	0.091	N/A
0.5	12.5	N/A	N/A	N/A	0.109	N/A
0.75	18.75	N/A	N/A	N/A	0.113	N/A
1	25	N/A	N/A	N/A	0.133	N/A
1.25	31.75	N/A	N/A	N/A	0.140	N/A
1.5	37.5	N/A	N/A	N/A	0.145	N/A
2	50	N/A	N/A	N/A	0.154	N/A
2.5	62.5	N/A	N/A	N/A	0.203	N/A
3	75	N/A	N/A	N/A	0.216	N/A
3.5	87.5	N/A	N/A	N/A	0.226	N/A

4	**100**	N/A	N/A	N/A	0.237	N/A
5	**125**	N/A	N/A	N/A	0.258	N/A
6	**150**	N/A	N/A	N/A	0.280	N/A
8	**200**	N/A	0.250	0.277	0.322	0.406
10	**250**	N/A	0.250	0.307	0.365	0.500
12	**300**	N/A	0.250	0.330	0.406	0.562
14	**350**	0.250	0.312	0.375	0.438	0.594
16	**400**	0.250	0.312	0.375	0.500	0.656
18	**450**	0.250	0.312	0.438	0.562	0.750
20	**500**	0.250	0.375	0.500	0.594	0.812
22	**550**	0.250	0.375	0.500	N/A	0.875
24	**600**	0.250	0.375	0.562	0.688	0.969
26	**650**	0.312	0.500	N/A	N/A	N/A
28	**700**	0.312	0.500	0.625	N/A	N/A
30	**750**	0.312	0.500	0.625	N/A	N/A
32	**800**	0.312	0.500	0.625	0.688	N/A
34	**850**	0.344	0.500	0.625	0.688	N/A
36	**900**	0.312	0.500	0.625	0.750	N/A
38	**950**	N/A	N/A	N/A	N/A	N/A
40	**1000**	N/A	N/A	N/A	N/A	N/A
42	**1050**	N/A	N/A	N/A	N/A	N/A
44	**1100**	N/A	N/A	N/A	N/A	N/A
46	**1150**	N/A	N/A	N/A	N/A	N/A
48	**1200**	N/A	N/A	N/A	N/A	N/A
52	**1300**	N/A	N/A	N/A	N/A	N/A

6.19M-1985 (SS)

Schedule versus Pipe ID (inches)

CARBON STEEL							
80	100	120	140	160	STD	XS	XXS
0.215	N/A	N/A	N/A	N/A	0.269	0.215	N/A
0.302	N/A	N/A	N/A	N/A	0.364	0.302	N/A
0.423	N/A	N/A	N/A	N/A	0.493	0.423	N/A
0.546	N/A	N/A	N/A	0.466	0.622	0.546	0.252
0.742	N/A	N/A	N/A	0.612	0.824	0.742	0.434
0.957	N/A	N/A	N/A	0.815	1.049	0.957	0.599
1.278	N/A	N/A	N/A	1.160	1.380	1.278	0.896
1.500	N/A	N/A	N/A	1.338	1.610	1.500	1.100
1.939	N/A	N/A	N/A	1.687	2.067	1.939	1.503
2.323	N/A	N/A	N/A	2.125	2.469	2.323	1.771
2.900	N/A	N/A	N/A	2.624	3.068	2.900	2.300
3.364	N/A	N/A	N/A	N/A	3.548	3.364	N/A
3.826	N/A	3.624	N/A	3.438	4.026	3.826	3.152
4.813	N/A	4.563	N/A	4.313	5.047	4.813	4.063
5.761	N/A	5.501	N/A	5.187	6.065	5.761	4.897
7.625	7.437	7.187	7.001	6.813	7.981	7.625	6.875
9.562	9.312	9.062	8.750	8.500	10.020	9.750	8.750
11.374	11.062	10.750	10.500	10.126	12.000	11.750	10.750
12.500	12.124	11.812	11.500	11.188	13.250	13.000	N/A
14.312	13.938	13.562	13.124	12.812	15.250	15.000	N/A
16.124	15.688	15.250	14.876	14.438	17.250	17.000	N/A
17.938	17.438	17.000	16.500	16.062	19.250	19.000	N/A
19.750	19.250	18.750	18.250	17.750	21.250	21.000	N/A
21.562	20.938	20.376	19.876	19.312	23.250	23.000	N/A
N/A	N/A	N/A	N/A	N/A	25.250	25.000	N/A
N/A	N/A	N/A	N/A	N/A	27.250	27.000	N/A
N/A	N/A	N/A	N/A	N/A	29.250	29.000	N/A
N/A	N/A	N/A	N/A	N/A	31.250	31.000	N/A
N/A	N/A	N/A	N/A	N/A	33.250	33.000	N/A
N/A	N/A	N/A	N/A	N/A	35.250	35.000	N/A
N/A	N/A	N/A	N/A	N/A	37.250	37.000	N/A
N/A	N/A	N/A	N/A	N/A	39.250	39.000	N/A
N/A	N/A	N/A	N/A	N/A	41.250	41.000	N/A
N/A	N/A	N/A	N/A	N/A	43.250	43.000	N/A
N/A	N/A	N/A	N/A	N/A	45.250	45.000	N/A
N/A	N/A	N/A	N/A	N/A	47.250	47.000	N/A
N/A	N/A	N/A	N/A	N/A	51.250	51.000	N/A

Schedule versus Wall Thickness (inches)

CARBON STEEL							
80	100	120	140	160	STD	XS	XXS
0.095	N/A	N/A	N/A	N/A	0.068	0.095	N/A
0.119	N/A	N/A	N/A	N/A	0.088	0.119	N/A
0.126	N/A	N/A	N/A	N/A	0.091	0.126	N/A
0.147	N/A	N/A	N/A	0.187	0.109	0.147	0.294
0.154	N/A	N/A	N/A	0.219	0.113	0.154	0.308
0.179	N/A	N/A	N/A	0.250	0.133	0.179	0.358
0.191	N/A	N/A	N/A	0.250	0.140	0.191	0.382
0.200	N/A	N/A	N/A	0.281	0.145	0.200	0.400
0.218	N/A	N/A	N/A	0.344	0.154	0.218	0.436
0.276	N/A	N/A	N/A	0.375	0.203	0.276	0.552
0.300	N/A	N/A	N/A	0.438	0.216	0.300	0.600
0.318	N/A	N/A	N/A	N/A	0.226	0.318	N/A

0.337	N/A	0.438	N/A	0.531	0.237	0.337	0.674
0.375	N/A	0.500	N/A	0.625	0.258	0.375	0.750
0.432	N/A	0.562	N/A	0.719	0.280	0.432	0.864
0.500	0.594	0.719	0.812	0.906	0.322	0.500	0.875
0.594	0.719	0.844	1.000	1.125	0.365	0.500	1.000
0.688	0.844	1.000	1.125	1.312	0.375	0.500	1.000
0.750	0.938	1.094	1.250	1.406	0.375	0.500	N/A
0.844	1.031	1.219	1.438	1.594	0.375	0.500	N/A
0.938	1.156	1.375	1.562	1.781	0.375	0.500	N/A
1.031	1.281	1.500	1.750	1.969	0.375	0.500	N/A
1.125	1.375	1.625	1.875	2.125	0.375	0.500	N/A
1.219	1.531	1.812	2.062	2.344	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A

STAINLESS STEEL			
5S	**10S**	**40S**	**80S**
N/A	0.307	0.269	0.215
N/A	0.410	0.364	0.302
N/A	0.545	0.493	0.423
0.710	0.674	0.622	0.546
0.920	0.884	0.824	0.742
1.185	1.094	1.049	0.957
1.530	1.442	1.380	1.278
1.770	1.682	1.610	1.500
2.245	2.157	2.067	1.939
2.709	2.635	2.469	2.323
3.334	3.260	3.068	2.900
3.834	3.760	3.548	3.364
4.334	4.260	4.026	3.826
5.345	5.295	5.047	4.813
6.407	6.375	6.065	5.761
8.407	8.329	7.981	7.625
10.482	10.420	10.020	9.750
12.438	12.390	12.000	11.750
13.688	13.624	N/A	N/A
15.670	15.624	N/A	N/A
17.670	17.624	N/A	N/A
19.624	19.564	N/A	N/A
21.624	21.564	N/A	N/A
23.564	23.500	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
29.500	29.376	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

STAINLESS STEEL			
5S	**10S**	**40S**	**80S**
N/A	0.049	0.068	0.095
N/A	0.065	0.088	0.119
N/A	0.065	0.091	0.126
0.065	0.083	0.109	0.147
0.065	0.083	0.113	0.154
0.065	0.109	0.133	0.179
0.065	0.109	0.140	0.191
0.065	0.109	0.145	0.200
0.065	0.109	0.154	0.218
0.083	0.120	0.203	0.276
0.083	0.120	0.216	0.300
0.083	0.120	0.226	0.318

0.083	0.120	0.237	0.337
0.109	0.134	0.258	0.375
0.109	0.134	0.280	0.432
0.109	0.148	0.322	0.500
0.134	0.165	0.365	0.500
0.156	0.180	0.375	0.500
0.156	0.188	N/A	N/A
0.165	0.188	N/A	N/A
0.165	0.188	N/A	N/A
0.188	0.218	N/A	N/A
0.188	0.218	N/A	N/A
0.218	0.250	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
0.250	0.312	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

Project Name : Binak compressor station
Item Name : Potable Water Pump P-2209
Prepared by : M.Aryafar

PUMP CALCULATION

OPERATING DATA

Temperature (°C)	Amb.
Density @ Op. (Kg/m3)	1024
Vapor pressure @ Op.(Bar a)	0.100
Viscosity @ Op. (cP)	1.60
Normal capacity (m3/hr)	5.0
Dedign Factor %	10%
Design capacity (m3/hr)	5.5

SUCTION PRESSURE CALCULATION AT Qd

		Bar g	m
Min. liquid level in drum (Truck)	1>>>>>		0.00
Max. liquid level in drum (Truck)	2>>>>>		2.00
Bottom of drum (Truck) Distanc from pump center line	3>>>>>		0.50
Total suction pressure drop in line & fittings	4>>>>>	-0.1	-0.99
Drum operating pressure	5>>>>>	0.0	0.0
Min suction liquid pressure	1+3+4+5=6>>>>>	-0.05	-0.5
		Bar a	m
Absolute pressure	7>>>>>	1.013	-
Vapor pressure @ Op.	8>>>>>	0.10	-
Available NPSH	6-8+7=9>>>>>	0.86	8.6
Max required NPSH (by vendor)			

DISCHARGE PRESSURE CALCULATION AT Qd

		Bar g	m
Outlet pressure at injection point	10>>>>>	0.5	
Static head above pump axis	11>>>>>	0.8	7.8
Total discharge pressure drop in equipment	12>>>>>	0.0	
Total discharge pressure drop in line & fittings	13>>>>>	-0.05	
Calculated discharge pressure	10+11+12-13=14>>>>>	1.3	
Total discharge pressure	16+6>>>>>	1.95	

DIFFERENTIAL PRESSURE CALCULATION

		Bar	m
Differential pressure (at Qn)	14-6=15>>>>>	1.39	13.8
Estimated differential pressure (at Qn)	16≥15	2.0	19.9

DESIGN PRESSURE ESTIMATION

		Bar g	m
Maximum suction pressure	17>>>>>	0.15	2
20% of differential pressure at Qd	1.2X16=18>>>>>	2.4	
Pump design pressure (shut off pressure)	17+18=19>>>>>	2.6	

POWER CONSUMPTION ESTIMATION AT QD

Pump efficiency (Ep)	31%
Estimated hydraulic power @ Qd (KW)	0.3
Brake power (BHP) (hydraulic power/Ep)	1.0
Estimated efficiency of electro motor (EM)	-
Absorbed power (KW)	-

PRESSURE DROP CALCULATION

SUCTION PRESSURE DROP

Design capacity (m3/hr)	5.5	
Viscosity @ Op. (cP)	1.60	
Density @ Op. (Kg/m3)	1024.0	
E (m)	0.000046	
Pipe size (in)	2.0	
SCH	STD	
Thk (in)	0.15	
ID (m)	0.05	
Velosity (m/s)	0.71	
Re	23724.5	
Friction factor (f)	0.03	
Pressure drop (bar/100m)	0.13031	
Acceptable Pressure Drop (bar/100m)- Base on design criteria	0.35	**OK**
Acceptable Velosity (m/s)- Base on design criteria	1.20	**OK**
E/D	0.00088	
a	6.10805	
b	6.10806	
a-b	-0.00001	

	L/D	No.	
Ball/Gate Valve Fully Open Conventional	13	2	1.3
Check Valve Fully Open	135	1	6.9
Tee with Flow Through branch	20	3	3.0
Elbow 90 Long Radius	13	2	1.3
Line lenght	-	-	10
Static Head		M	0.0
Total Equi. Length (m)			22.5
			Bar
Strainer		1	0.07
Total Equi. Length (Bar)			-0.029
Total Pressure Drop (Bar)			-0.099

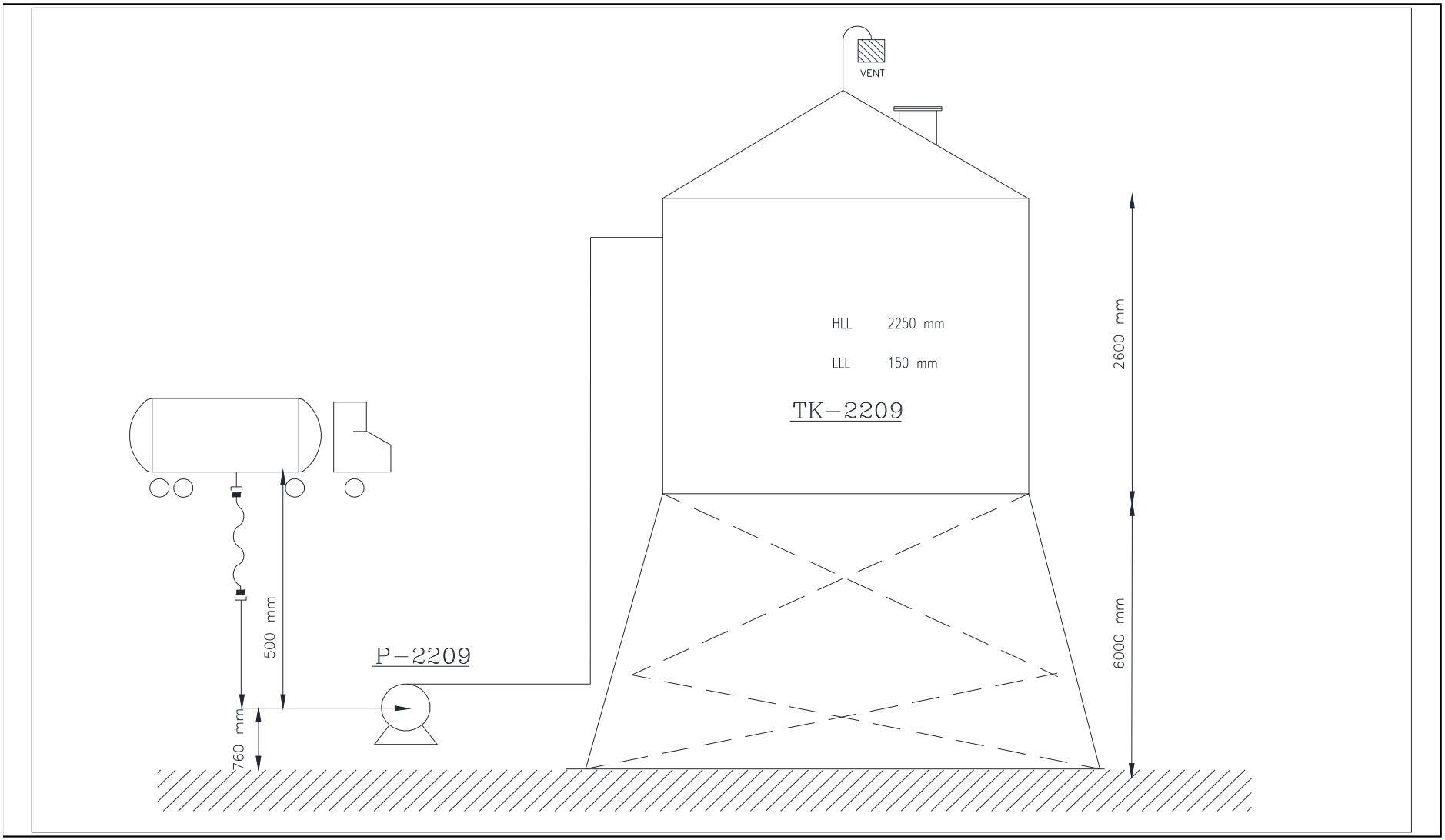
DISCHARG LINE PRESSURE DROP

Design capacity (m3/hr)	5.5	
Viscosity @ Op. (cP)	1.60	
Density @ Op. (Kg/m3)	1024.0	
E (m)	0.000046	
Pipe size (in)	2.0	
SCH	STD	
Thk (in)	0.15	
ID (m)	0.05	
Velosity (m/s)	0.71	
Re	23724.5	
Friction factor (f)	0.02680	
Pressure drop (bar/100m)	0.13031	
Acceptable Pressure Drop (bar/100m)- Base on design criteria	0.45	**OK**
Acceptable Velosity (m/s)- Base on design criteria	1.50	**OK**
E/D	0.00088	
a	6.10805	
b	6.10806	
a-b	-0.00001	

	L/D	No.	
Ball/Gate Valve Fully Open Conventional	13	2	1.3
Check Valve Fully Open	135	1	6.9
Tee with Flow Through branch	60	3	9.1
Elbow 90 Long Radius	20	4	4.1
Line lenght	-	-	20
Static Head		M	0.0

Total Equi. Length (m)	41.4
Total Equi. Length (Bar)	-0.054
Total Pressure Drop (Bar)	-0.054

NOTES:


VENT
HLL 2250 mm
LLL 150 mm
TK-2209
2600 mm
6000 mm
500 mm
760 mm
P-2209

Data shown below: ANSI / ASME B36.10M-1996 (CS), ANSI / ASME B3

Nominal Size (incl	Nominal Size (mm)	10	20	30	40	60
0.125	3.13	N/A	N/A	N/A	0.269	N/A
0.25	6.25	N/A	N/A	N/A	0.364	N/A
0.375	9.39	N/A	N/A	N/A	0.493	N/A
0.5	12.5	N/A	N/A	N/A	0.622	N/A
0.75	18.75	N/A	N/A	N/A	0.824	N/A
1	25	N/A	N/A	N/A	1.049	N/A
1.25	31.75	N/A	N/A	N/A	1.380	N/A
1.5	37.5	N/A	N/A	N/A	1.610	N/A
2	50	N/A	N/A	N/A	2.067	N/A
2.5	62.5	N/A	N/A	N/A	2.469	N/A
3	75	N/A	N/A	N/A	3.068	N/A
3.5	87.5	N/A	N/A	N/A	3.548	N/A
4	100	N/A	N/A	N/A	4.026	N/A
5	125	N/A	N/A	N/A	5.047	N/A
6	150	N/A	N/A	N/A	6.065	N/A
8	200	N/A	8.125	8.071	7.981	7.813
10	250	N/A	10.250	10.136	10.020	9.750
12	300	N/A	12.250	12.090	11.938	11.626
14	350	13.500	13.376	13.250	13.124	12.812
16	400	15.500	15.376	15.250	15.000	14.688
18	450	17.500	17.376	17.124	16.876	16.500
20	500	19.500	19.250	19.000	18.812	18.376
22	550	21.500	21.250	21.000	N/A	20.250
24	600	23.500	23.250	22.876	22.624	22.062
26	650	25.376	25.000	N/A	N/A	N/A
28	700	27.376	27.000	26.750	N/A	N/A
30	750	29.376	29.000	28.750	N/A	N/A
32	800	31.376	31.000	30.750	30.624	N/A
34	850	33.312	33.000	32.750	32.624	N/A
36	900	35.376	35.000	34.750	34.500	N/A
38	950	N/A	N/A	N/A	N/A	N/A
40	1000	N/A	N/A	N/A	N/A	N/A
42	1050	N/A	N/A	N/A	N/A	N/A
44	1100	N/A	N/A	N/A	N/A	N/A
46	1150	N/A	N/A	N/A	N/A	N/A
48	1200	N/A	N/A	N/A	N/A	N/A
52	1300	N/A	N/A	N/A	N/A	N/A

Nominal Size (incl	Nominal Size (mm)	10	20	30	40	60
0.125	3.13	N/A	N/A	N/A	0.068	N/A
0.25	6.25	N/A	N/A	N/A	0.088	N/A
0.375	9.39	N/A	N/A	N/A	0.091	N/A
0.5	12.5	N/A	N/A	N/A	0.109	N/A
0.75	18.75	N/A	N/A	N/A	0.113	N/A
1	25	N/A	N/A	N/A	0.133	N/A
1.25	31.75	N/A	N/A	N/A	0.140	N/A
1.5	37.5	N/A	N/A	N/A	0.145	N/A
2	50	N/A	N/A	N/A	0.154	N/A
2.5	62.5	N/A	N/A	N/A	0.203	N/A
3	75	N/A	N/A	N/A	0.216	N/A
3.5	87.5	N/A	N/A	N/A	0.226	N/A

4	**100**	N/A	N/A	N/A	0.237	N/A
5	**125**	N/A	N/A	N/A	0.258	N/A
6	**150**	N/A	N/A	N/A	0.280	N/A
8	**200**	N/A	0.250	0.277	0.322	0.406
10	**250**	N/A	0.250	0.307	0.365	0.500
12	**300**	N/A	0.250	0.330	0.406	0.562
14	**350**	0.250	0.312	0.375	0.438	0.594
16	**400**	0.250	0.312	0.375	0.500	0.656
18	**450**	0.250	0.312	0.438	0.562	0.750
20	**500**	0.250	0.375	0.500	0.594	0.812
22	**550**	0.250	0.375	0.500	N/A	0.875
24	**600**	0.250	0.375	0.562	0.688	0.969
26	**650**	0.312	0.500	N/A	N/A	N/A
28	**700**	0.312	0.500	0.625	N/A	N/A
30	**750**	0.312	0.500	0.625	N/A	N/A
32	**800**	0.312	0.500	0.625	0.688	N/A
34	**850**	0.344	0.500	0.625	0.688	N/A
36	**900**	0.312	0.500	0.625	0.750	N/A
38	**950**	N/A	N/A	N/A	N/A	N/A
40	**1000**	N/A	N/A	N/A	N/A	N/A
42	**1050**	N/A	N/A	N/A	N/A	N/A
44	**1100**	N/A	N/A	N/A	N/A	N/A
46	**1150**	N/A	N/A	N/A	N/A	N/A
48	**1200**	N/A	N/A	N/A	N/A	N/A
52	**1300**	N/A	N/A	N/A	N/A	N/A

6.19M-1985 (SS)

Schedule versus Pipe ID (inches)

CARBON STEEL							
80	100	120	140	160	STD	XS	XXS
0.215	N/A	N/A	N/A	N/A	0.269	0.215	N/A
0.302	N/A	N/A	N/A	N/A	0.364	0.302	N/A
0.423	N/A	N/A	N/A	N/A	0.493	0.423	N/A
0.546	N/A	N/A	N/A	0.466	0.622	0.546	0.252
0.742	N/A	N/A	N/A	0.612	0.824	0.742	0.434
0.957	N/A	N/A	N/A	0.815	1.049	0.957	0.599
1.278	N/A	N/A	N/A	1.160	1.380	1.278	0.896
1.500	N/A	N/A	N/A	1.338	1.610	1.500	1.100
1.939	N/A	N/A	N/A	1.687	2.067	1.939	1.503
2.323	N/A	N/A	N/A	2.125	2.469	2.323	1.771
2.900	N/A	N/A	N/A	2.624	3.068	2.900	2.300
3.364	N/A	N/A	N/A	N/A	3.548	3.364	N/A
3.826	N/A	3.624	N/A	3.438	4.026	3.826	3.152
4.813	N/A	4.563	N/A	4.313	5.047	4.813	4.063
5.761	N/A	5.501	N/A	5.187	6.065	5.761	4.897
7.625	7.437	7.187	7.001	6.813	7.981	7.625	6.875
9.562	9.312	9.062	8.750	8.500	10.020	9.750	8.750
11.374	11.062	10.750	10.500	10.126	12.000	11.750	10.750
12.500	12.124	11.812	11.500	11.188	13.250	13.000	N/A
14.312	13.938	13.562	13.124	12.812	15.250	15.000	N/A
16.124	15.688	15.250	14.876	14.438	17.250	17.000	N/A
17.938	17.438	17.000	16.500	16.062	19.250	19.000	N/A
19.750	19.250	18.750	18.250	17.750	21.250	21.000	N/A
21.562	20.938	20.376	19.876	19.312	23.250	23.000	N/A
N/A	N/A	N/A	N/A	N/A	25.250	25.000	N/A
N/A	N/A	N/A	N/A	N/A	27.250	27.000	N/A
N/A	N/A	N/A	N/A	N/A	29.250	29.000	N/A
N/A	N/A	N/A	N/A	N/A	31.250	31.000	N/A
N/A	N/A	N/A	N/A	N/A	33.250	33.000	N/A
N/A	N/A	N/A	N/A	N/A	35.250	35.000	N/A
N/A	N/A	N/A	N/A	N/A	37.250	37.000	N/A
N/A	N/A	N/A	N/A	N/A	39.250	39.000	N/A
N/A	N/A	N/A	N/A	N/A	41.250	41.000	N/A
N/A	N/A	N/A	N/A	N/A	43.250	43.000	N/A
N/A	N/A	N/A	N/A	N/A	45.250	45.000	N/A
N/A	N/A	N/A	N/A	N/A	47.250	47.000	N/A
N/A	N/A	N/A	N/A	N/A	51.250	51.000	N/A

Schedule versus Wall Thickness (inches)

CARBON STEEL							
80	100	120	140	160	STD	XS	XXS
0.095	N/A	N/A	N/A	N/A	0.068	0.095	N/A
0.119	N/A	N/A	N/A	N/A	0.088	0.119	N/A
0.126	N/A	N/A	N/A	N/A	0.091	0.126	N/A
0.147	N/A	N/A	N/A	0.187	0.109	0.147	0.294
0.154	N/A	N/A	N/A	0.219	0.113	0.154	0.308
0.179	N/A	N/A	N/A	0.250	0.133	0.179	0.358
0.191	N/A	N/A	N/A	0.250	0.140	0.191	0.382
0.200	N/A	N/A	N/A	0.281	0.145	0.200	0.400
0.218	N/A	N/A	N/A	0.344	0.154	0.218	0.436
0.276	N/A	N/A	N/A	0.375	0.203	0.276	0.552
0.300	N/A	N/A	N/A	0.438	0.216	0.300	0.600
0.318	N/A	N/A	N/A	N/A	0.226	0.318	N/A

0.337	N/A	0.438	N/A	0.531	0.237	0.337	0.674
0.375	N/A	0.500	N/A	0.625	0.258	0.375	0.750
0.432	N/A	0.562	N/A	0.719	0.280	0.432	0.864
0.500	0.594	0.719	0.812	0.906	0.322	0.500	0.875
0.594	0.719	0.844	1.000	1.125	0.365	0.500	1.000
0.688	0.844	1.000	1.125	1.312	0.375	0.500	1.000
0.750	0.938	1.094	1.250	1.406	0.375	0.500	N/A
0.844	1.031	1.219	1.438	1.594	0.375	0.500	N/A
0.938	1.156	1.375	1.562	1.781	0.375	0.500	N/A
1.031	1.281	1.500	1.750	1.969	0.375	0.500	N/A
1.125	1.375	1.625	1.875	2.125	0.375	0.500	N/A
1.219	1.531	1.812	2.062	2.344	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A
N/A	N/A	N/A	N/A	N/A	0.375	0.500	N/A

STAINLESS STEEL			
5S	**10S**	**40S**	**80S**
N/A	0.307	0.269	0.215
N/A	0.410	0.364	0.302
N/A	0.545	0.493	0.423
0.710	0.674	0.622	0.546
0.920	0.884	0.824	0.742
1.185	1.094	1.049	0.957
1.530	1.442	1.380	1.278
1.770	1.682	1.610	1.500
2.245	2.157	2.067	1.939
2.709	2.635	2.469	2.323
3.334	3.260	3.068	2.900
3.834	3.760	3.548	3.364
4.334	4.260	4.026	3.826
5.345	5.295	5.047	4.813
6.407	6.375	6.065	5.761
8.407	8.329	7.981	7.625
10.482	10.420	10.020	9.750
12.438	12.390	12.000	11.750
13.688	13.624	N/A	N/A
15.670	15.624	N/A	N/A
17.670	17.624	N/A	N/A
19.624	19.564	N/A	N/A
21.624	21.564	N/A	N/A
23.564	23.500	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
29.500	29.376	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

STAINLESS STEEL			
5S	**10S**	**40S**	**80S**
N/A	0.049	0.068	0.095
N/A	0.065	0.088	0.119
N/A	0.065	0.091	0.126
0.065	0.083	0.109	0.147
0.065	0.083	0.113	0.154
0.065	0.109	0.133	0.179
0.065	0.109	0.140	0.191
0.065	0.109	0.145	0.200
0.065	0.109	0.154	0.218
0.083	0.120	0.203	0.276
0.083	0.120	0.216	0.300
0.083	0.120	0.226	0.318

0.083	0.120	0.237	0.337
0.109	0.134	0.258	0.375
0.109	0.134	0.280	0.432
0.109	0.148	0.322	0.500
0.134	0.165	0.365	0.500
0.156	0.180	0.375	0.500
0.156	0.188	N/A	N/A
0.165	0.188	N/A	N/A
0.165	0.188	N/A	N/A
0.188	0.218	N/A	N/A
0.188	0.218	N/A	N/A
0.218	0.250	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
0.250	0.312	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A