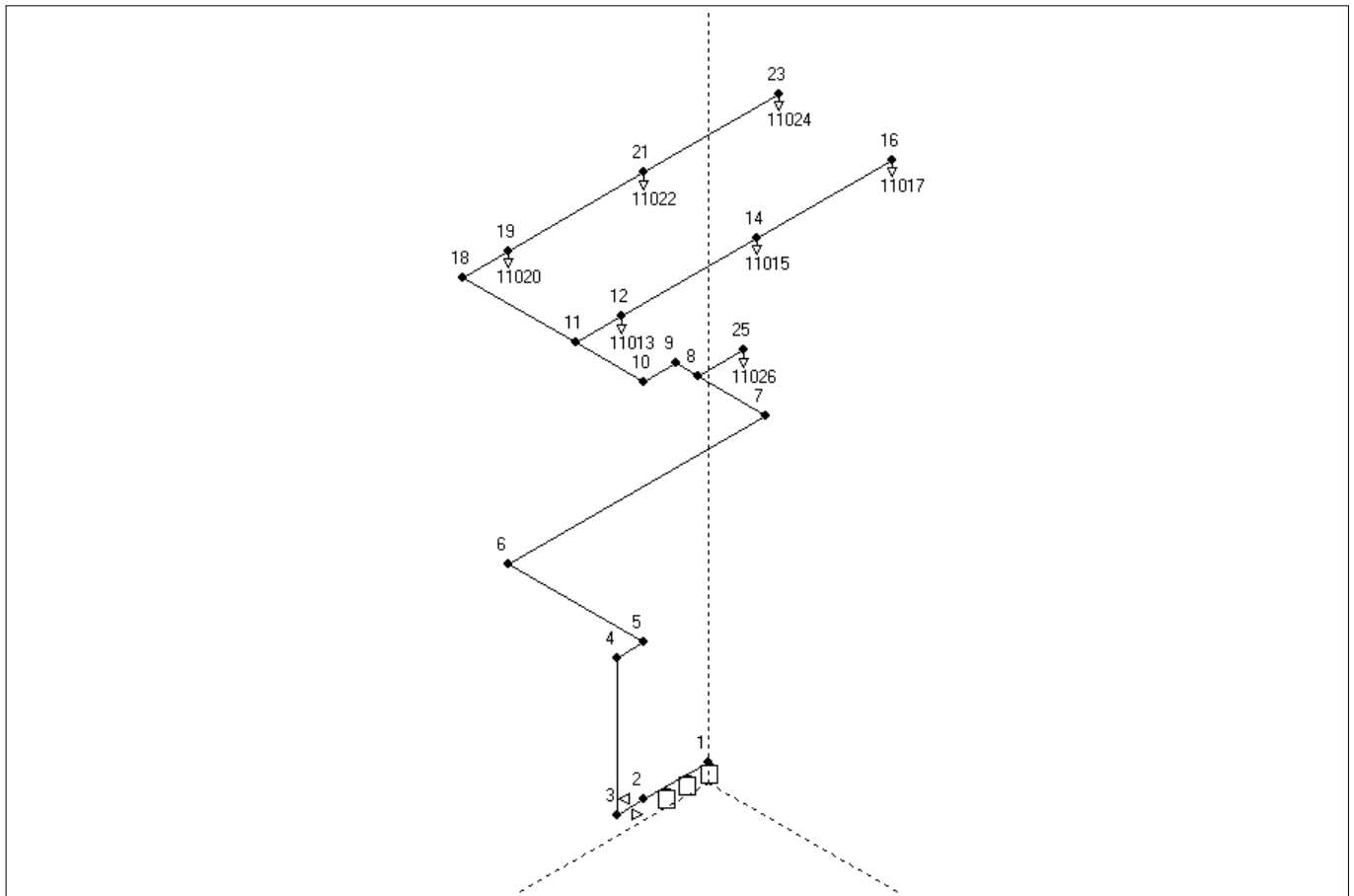


Project: 12I051R0
Project-No:
Building: ARCHIVIO ASL
Object:
Contractor:
Owner:
Project engineer:
Date: 23/05/2012
Altitude above sealevel: 0 m
Regulation rule for calculation of Argon quantities: ISO 14520-1, Edition 2000

Pipe catalogue: LPGDiametros.rkl
Component catalogue: LPGComponentes.arm
Nozzle catalogue: LPGDifusores.noz





Pipesystem data:

Section- No:	Starting- node	Endnode Nozzle	Length [m]	Height [m]	Pipetype	Diameter [mm] **	Fitting *	code	Component coefficient	Nb of containers Argon quantity
1	0	1	0,400	0,400	22	18,8	C	128	9,000	3,0
2	1	2	1,425	0,000	33	42,9	E	-	-	0,0
3	2	3	0,600	0,000	13	35,0	R	-	-	0,0
4	3	4	3,000	3,000	13	35,0	E	-	-	0,0
5	4	5	0,600	0,000	13	35,0	E	-	-	0,0
6	5	6	3,000	0,000	13	35,0	E	-	-	0,0
7	6	7	5,700	0,000	13	35,0	E	-	-	0,0
8	7	8	1,500	0,000	13	35,0	E	-	-	0,0
9	8	9	0,500	0,000	13	35,0	T-0°	-	-	0,0
10	9	10	0,700	0,000	13	35,0	E	-	-	0,0
11	10	11	1,500	0,000	13	35,0	E	-	-	0,0
12	11	12	1,000	0,000	13	26,6	T-90°	-	-	0,0
13	12	11013	0,150	-0,150	13	26,6	T-90°	-	-	0,0
14	12	14	3,000	0,000	13	26,6	T-0°	-	-	0,0
15	14	11015	0,150	-0,150	13	26,6	T-90°	-	-	0,0
16	14	16	3,000	0,000	13	26,6	T-0°	-	-	0,0
17	16	11017	0,150	-0,150	13	26,6	E	-	-	0,0
18	11	18	2,500	0,000	13	26,6	T-0°	-	-	0,0
19	18	19	1,000	0,000	13	26,6	E	-	-	0,0
20	19	11020	0,150	-0,150	13	26,6	T-90°	-	-	0,0
21	19	21	3,000	0,000	13	26,6	T-0°	-	-	0,0
22	21	11022	0,150	-0,150	13	26,6	T-90°	-	-	0,0
23	21	23	3,000	0,000	13	26,6	T-0°	-	-	0,0
24	23	11024	0,150	-0,150	13	26,6	E	-	-	0,0
25	8	25	1,000	0,000	13	26,6	T-90°	-	-	0,0
26	25	11026	0,150	-0,150	13	26,6	E	-	-	0,0

* C=Component, B=Bend, T=T-Piece, E=Elbow, R=Restrictor

** If a pipe diameter is equal zero see the extra table of the calculated diameters

Legend of pipetypes

Type	Pipeclass	Pipe roughness
22	SCH 160/80	hose
33	SCH 160/80 300 bar	black pipe
13	SCH 40	black pipe

Legend of components

Code	Type	Resistance coefficient
128	LPG 128	9,000



Nozzle data:

No.	Calculation zone	Diameter [mm]
11013	AMBIENTE	9,4
11015	AMBIENTE	9,5
11017	AMBIENTE	9,4
11024	AMBIENTE	9,6
11022	AMBIENTE	9,7
11020	AMBIENTE	9,6
11026	AMBIENTE 1	5,5

Legend of nozzles and restrictor:

Type	Number of orifices	C1	C2	C3	C4	C5	C6
1 Nozzle 1	1	-0,183	0,031	0,000	0,000	0,000	0,000
Restrictor		-0,131	0,008	0,000	0,000	0,000	0,000



Calculation zone data:

Calculation of design quantity:

Zone	Total volume [m3]	Volume of building parts [m3]	Calculated volume [m3]	Max. Over-pressure [mbar]	Design temp. [°C]	Extinguish-conc. [% Vol]	Design factor	Design conc. [% Vol]	Design quantity [kg]
1 AMBIENTE	161,3	0,0	161,3	6,000	20,0	32,2	1,30	41,9	145,53
2 AMBIENTE 1	11,3	0,0	11,3	6,000	20,0	32,2	1,30	41,9	10,15

Regulation rule for calculation of Argon quantities: ISO 14520-1, Edition 2000

Altitude above sealevel: 0,0 m

Argon storage input data:

Container volume: 140,0 l
Container pressure: 300,0 bar abs
Storage temperature: 15,0 °C
Supplement factor: 1,00
Minimum storage quantity: 155,68 kg
Number of containers: 3

Discharge time (input value): 60,0 s
Pressure downstream restrictor: 60,0 bar

Further information:

Design with included gas discharge time
Design with predetermined orifice diameters
Design with predetermined restrictor diameter



Calculation results:

Argon design data:

Design quantity:	155,68
Supplement factor:	1,00
Minimum storage quantity:	155,68
Container volume:	140,0 l
Container pressure:	300,0 bar abs
Argon-mass in one container:	70,5 kg
Number of containers:	3
Actual storage quantity:	211,4 kg
Storage temperature:	15,0 °C
Starting container pressure:	300,0 bar abs

Discharge time:

Total discharge time of air and Argon:	52,6 s
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System information:

Restrictor diameter:	9,0 mm
Container working pressure:	206,3 bar abs
Total network volume:	28,6 l



Pipe system:

Section- No:	Starting- node	Endnode Nozzle	Pressure [bar abs]	Temperature [°C]	Flowrate [kg/s]	Pipedimension Di [mm]	DN
1	0	1	203,98	-3,44	1,24	18,8	3/4
2	1	2	203,84	-3,46	3,77	42,9	2
3	2	3	45,84	-33,85	3,77	35,0	1 1/4
4	3	4	43,67	-35,08	3,77	35,0	1 1/4
5	4	5	42,63	-35,70	3,77	35,0	1 1/4
6	5	6	40,33	-37,13	3,77	35,0	1 1/4
7	6	7	36,38	-39,79	3,77	35,0	1 1/4
8	7	8	34,61	-41,09	3,77	35,0	1 1/4
9	8	9	33,81	-41,30	3,53	35,0	1 1/4
10	9	10	32,61	-42,25	3,53	35,0	1 1/4
11	10	11	30,89	-43,67	3,53	35,0	1 1/4
12	11	12	28,56	-44,27	1,76	26,6	1
13	12	11013	27,06	-44,28	0,59	26,6	1
14	12	14	27,16	-45,09	1,17	26,6	1
15	14	11015	26,47	-45,10	0,59	26,6	1
16	14	16	26,72	-45,30	0,58	26,6	1
17	16	11017	26,62	-45,38	0,58	26,6	1
18	11	18	28,74	-45,09	1,76	26,6	1
19	18	19	27,31	-46,41	1,76	26,6	1
20	19	11020	25,79	-46,41	0,59	26,6	1
21	19	21	25,88	-47,29	1,17	26,6	1
22	21	11022	25,16	-47,30	0,59	26,6	1
23	21	23	25,41	-47,52	0,58	26,6	1
24	23	11024	25,31	-47,61	0,58	26,6	1
25	8	25	32,89	-41,10	0,24	26,6	1
26	25	11026	32,88	-41,11	0,24	26,6	1



Nozzle data:

Calculation- zone no:	Nozzle no.	Nozzle type	Number of orifices	Pipeconnection Di [mm]	DN	Orifice [mm]	Argon out- put [kg]
1	11013	1	1	26,6	1	9,4	24,1
1	11015	1	1	26,6	1	9,5	24,1
1	11017	1	1	26,6	1	9,4	23,8
1	11024	1	1	26,6	1	9,6	23,7
1	11022	1	1	26,6	1	9,7	24,0
1	11020	1	1	26,6	1	9,6	24,1
2	11026	1	1	26,6	1	5,5	10,0

MAX. TRANSPORT TIME DIFF. BETWEEN NOZZLES: 11024./ 11013. IS 0.31 S



Concentrations:

Calculation- zone no:	Gascomposition after the discharge of the design quantity [%]			
	O2	CO2	AR	N2
1	12,2	0,0	42,5	45,3
2	12,2	0,0	42,4	45,4

Total flooded design quantity within discharge time: 155,68 kg

Calculation- zone no:	Gascomposition after total discharge [%]			
	O2	CO2	AR	N2
1	10,0	0,0	53,0	37,0
2	10,0	0,0	52,8	37,2

Total flooded Argon mass: 210.7 KG

Pressure relief opening:

Calculation- zone no:	Recommended area against overpressure		Max. flow [kg/s]
	Area [m²]	Overpressure [mbar]	
1	0,164	6,0	5,40
2	0,011	6,0	0,38



Component list:

Nozzle-type	Number	C1	C2	C3	C4	C5	C6
1	7	-0,183	0,031	0,000	0,000	0,000	0,000
Restrictor	1	-0,131	0,008	0,000	0,000	0,000	0,000

Pipe-type	Di [mm]	DN	Length [m]
22	18,80	3/4	0,400
33	42,90	2	1,400
13	35,00	1 1/4	17,100
13	26,60	1	18,200

Number of bends (+) and elbows (-)

Bend-type	Di [mm]	DN	Number
-90	42,90	2	1
-90	35,00	1 1/4	7
-90	26,60	1	4

Number of T-distributors (in- and outdiameter)

Number	Input	90-out	90-out	0-out
1	35,0	26,6	0,0	35,0
1	35,0	26,6	0,0	26,6
4	26,6	26,6	0,0	26,6

Dynamic flooding results

The calculation bases on a mean nozzle pressure!

Flooding time [s]	Storage mass [kg]	Flooded ratio [%]	Flow [kg/s]	Storage pressure [bar]	Pressure downstream restrictor [bar]	Pressure at nozzle [bar]
0,0	211,4	0,0	0,00	300,0	1,0	1,0
2,5	179,1	15,3	4,73	247,4	61,3	35,8
2,7	178,0	15,8	4,65	242,4	60,0	35,0
3,0	176,8	16,4	4,57	237,7	58,8	34,3
3,2	175,7	16,9	4,50	233,3	57,6	33,7
3,5	174,6	17,4	4,54	229,1	58,2	34,3
3,7	173,4	18,0	4,49	225,2	57,2	33,5
4,0	172,3	18,5	4,42	221,4	56,2	32,9
4,2	171,2	19,0	4,36	217,7	55,3	32,4
4,7	169,1	20,0	4,30	212,9	54,4	31,8
5,2	167,0	21,0	4,22	207,6	53,1	31,1
7,2	158,8	24,9	4,10	190,8	51,3	30,3
9,2	151,0	28,6	3,80	172,7	46,7	27,4
11,0	143,7	32,0	3,58	155,5	43,4	25,5
16,0	127,9	39,5	2,95	121,3	34,7	20,5
21,0	114,7	45,7	2,44	98,9	28,0	16,7
26,0	103,6	51,0	2,10	84,3	23,7	14,2
31,0	93,9	55,6	1,86	74,3	20,7	12,5
36,0	85,1	59,7	1,67	66,8	18,6	11,2
41,0	77,5	63,4	1,46	61,1	16,2	9,8
46,0	70,5	66,6	1,34	56,4	14,9	9,0
51,0	64,2	69,7	1,24	52,3	13,9	8,4
56,0	58,6	72,3	1,07	49,0	12,0	7,3
61,0	53,5	74,7	0,99	46,0	11,3	6,9
66,0	48,7	76,9	0,92	43,1	10,6	6,4
71,0	44,3	79,0	0,86	40,3	9,9	6,0
76,0	40,2	81,0	0,79	37,6	9,2	5,6
81,0	36,5	82,7	0,73	35,1	8,6	5,3
86,0	33,2	84,3	0,63	32,9	7,5	4,6
91,0	30,2	85,7	0,58	30,8	7,0	4,3
96,0	27,4	87,0	0,54	28,7	6,6	4,0
101,0	24,8	88,2	0,50	26,8	6,1	3,8
106,0	22,5	89,4	0,46	24,8	5,7	3,5
111,0	20,3	90,4	0,42	23,0	5,3	3,2
116,0	18,4	91,3	0,38	21,2	4,9	3,0

Discharge meantime at nozzle:

52,6 s

