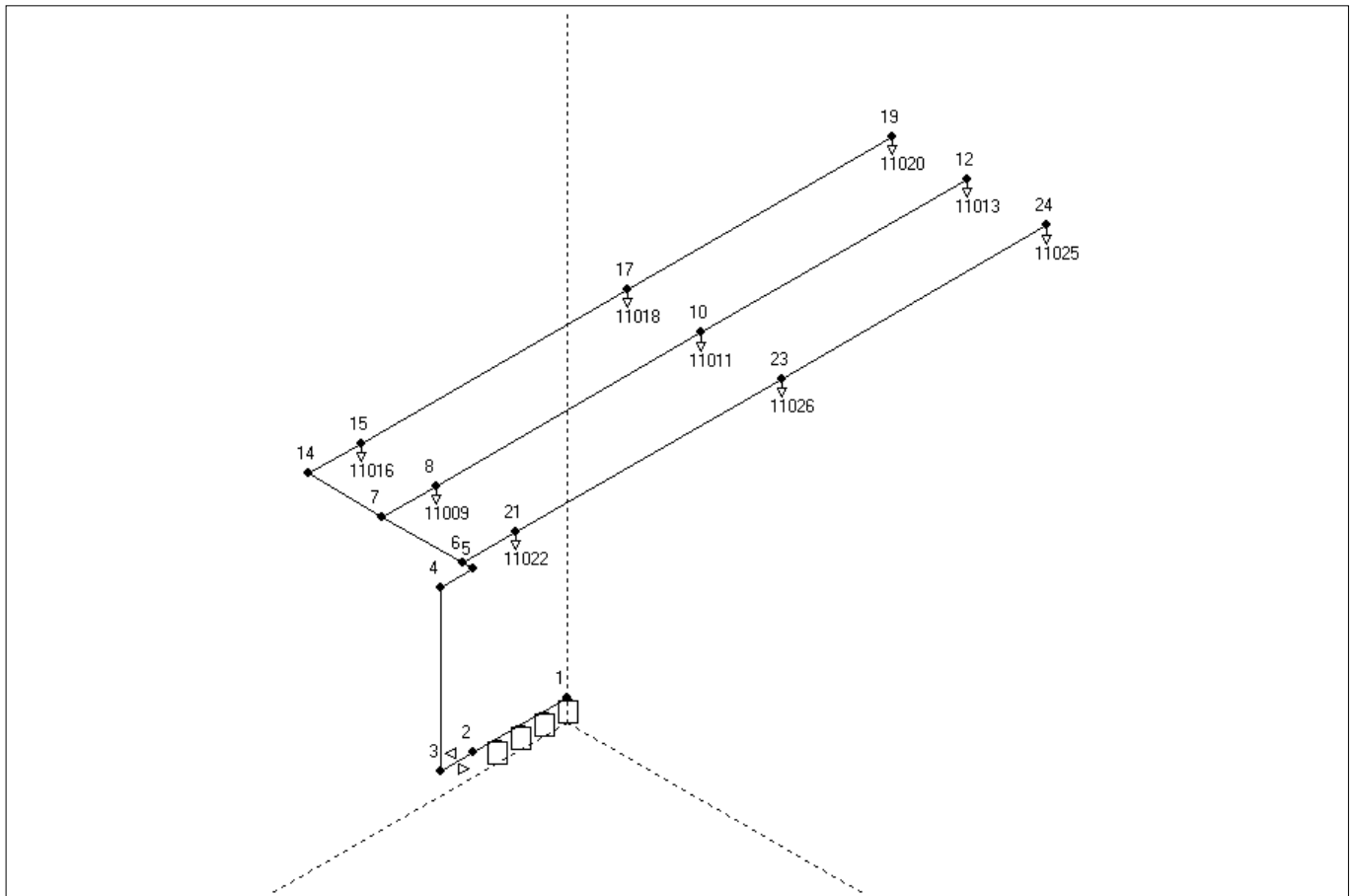


Project: 12I050R0
Project-No:
Building: ARCHIVIO A
Object:
Contractor:
Owner:
Project engineer:
Date: 23/05/2012
Altitude above sealevel: 0 m
Regulation rule for calculation of Argon quantities: ISO 14520-1, Edition 2000

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	4,0
2	1	2	1,775	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	0,200	0,000	13	35,0	E	-	-	0,0
7	6	7	1,500	0,000	13	35,0	T-0°	-	-	0,0
8	7	8	1,000	0,000	13	35,0	T-90°	-	-	0,0
9	8	11009	0,150	-0,150	13	26,6	T-90°	-	-	0,0
10	8	10	5,000	0,000	13	26,6	T-0°	-	-	0,0
11	10	11011	0,150	-0,150	13	26,6	T-90°	-	-	0,0
12	10	12	5,000	0,000	13	26,6	T-0°	-	-	0,0
13	12	11013	0,150	-0,150	13	26,6	E	-	-	0,0
14	7	14	1,400	0,000	13	35,0	T-0°	-	-	0,0
15	14	15	1,000	0,000	13	35,0	E	-	-	0,0
16	15	11016	0,150	-0,150	13	26,6	T-90°	-	-	0,0
17	15	17	5,000	0,000	13	26,6	T-0°	-	-	0,0
18	17	11018	0,150	-0,150	13	26,6	T-90°	-	-	0,0
19	17	19	5,000	0,000	13	26,6	T-0°	-	-	0,0
20	19	11020	0,150	-0,150	13	26,6	E	-	-	0,0
21	6	21	1,000	0,000	13	35,0	T-90°	-	-	0,0
22	21	11022	0,150	-0,150	13	26,6	T-90°	-	-	0,0
23	21	23	5,000	0,000	13	26,6	T-0°	-	-	0,0
24	23	24	5,000	0,000	13	26,6	T-0°	-	-	0,0
25	24	11025	0,150	-0,150	13	26,6	E	-	-	0,0
26	23	11026	0,150	-0,150	13	26,6	T-90°	-	-	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

22	SCH 160/80
33	SCH 160/80 300 bar
13	SCH 40

Pipe roughness

hose
black pipe
black pipe

Legend of components

Code Type

128	LPG 128
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Resistance coefficient

9,000



Nozzle data:

No.	Calculation zone	Diameter [mm]
11022	AMBIENTE	12,3
11009	AMBIENTE	12,6
11016	AMBIENTE	12,1
11018	AMBIENTE	13,4
11011	AMBIENTE	14,2
11026	AMBIENTE	13,9
11025	AMBIENTE	13,9
11013	AMBIENTE	14,3
11020	AMBIENTE	13,5

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	260,7	0,0	260,7	6,000	20,0	32,2	1,30	41,9	235,28

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:	235,28 kg
Number of containers:	4

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

Further information:

Design with included gas discharge time

Design with predetermined restrictor diameter



Calculation results:

Argon design data:

Design quantity:	235,28
Supplement factor:	1,00
Minimum storage quantity:	235,28
Container volume:	140,0 l
Container pressure:	300,0 bar abs
Argon-mass in one container:	70,5 kg
Number of containers:	4
Actual storage quantity:	281,9 kg
Storage temperature:	15,0 °C
Starting container pressure:	300,0 bar abs

Discharge time:

Total discharge time of air and Argon:	53,7 s
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System information:

Restrictor diameter:	12,0 mm
Container working pressure:	190,2 bar abs
Total network volume:	29,7 l



Pipe system:

Section- No:	Starting- node	Endnode Nozzle	Pressure [bar abs]	Temperature [°C]	Flowrate [kg/s]	Pipedimension Di [mm]	DN
1	0	1	186,36	-6,47	1,55	18,8	3/4
2	1	2	185,93	-6,53	6,19	42,9	2
3	2	3	39,66	-38,31	6,19	35,0	1 1/4
4	3	4	32,75	-44,15	6,19	35,0	1 1/4
5	4	5	29,10	-48,04	6,19	35,0	1 1/4
6	5	6	25,84	-52,17	6,19	35,0	1 1/4
7	6	7	22,57	-54,16	4,13	35,0	1 1/4
8	7	8	19,29	-54,56	2,06	35,0	1 1/4
9	8	11009	18,36	-54,58	0,69	26,6	1
10	8	10	15,71	-59,51	1,38	26,6	1
11	10	11011	14,34	-59,54	0,69	26,6	1
12	10	12	14,34	-60,96	0,69	26,6	1
13	12	11013	14,11	-61,34	0,69	26,6	1
14	7	14	21,26	-54,61	2,06	35,0	1 1/4
15	14	15	20,54	-55,44	2,06	35,0	1 1/4
16	15	11016	19,69	-55,45	0,69	26,6	1
17	15	17	17,26	-59,50	1,38	26,6	1
18	17	11018	15,99	-59,53	0,69	26,6	1
19	17	19	16,03	-60,66	0,69	26,6	1
20	19	11020	15,82	-60,96	0,69	26,6	1
21	6	21	19,94	-52,55	2,06	35,0	1 1/4
22	21	11022	19,04	-52,57	0,69	26,6	1
23	21	23	16,47	-57,14	1,38	26,6	1
24	23	24	15,16	-58,47	0,69	26,6	1
25	24	11025	14,93	-58,82	0,69	26,6	1
26	23	11026	15,14	-57,17	0,69	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	11022	1	1	26,6	1	12,3	26,2
1	11009	1	1	26,6	1	12,6	26,2
1	11016	1	1	26,6	1	12,1	26,2
1	11018	1	1	26,6	1	13,4	26,2
1	11011	1	1	26,6	1	14,2	26,2
1	11026	1	1	26,6	1	13,9	26,2
1	11025	1	1	26,6	1	13,9	26,2
1	11013	1	1	26,6	1	14,3	26,2
1	11020	1	1	26,6	1	13,5	26,2

MAX. TRANSPORT TIME DIFF. BETWEEN NOZZLES: 11020./ 11022. IS 0.31 S



Concentrations:

Calculation- zone no:	Gascomposition after the discharge of the design quantity [%]			
	O2	CO2	AR	N2
1	12,1	0,0	43,0	44,9

Total flooded design quantity within discharge time: 235,28 kg

Calculation- zone no:	Gascomposition after total discharge [%]			
	O2	CO2	AR	N2
1	10,8	0,0	48,9	40,3

Total flooded Argon mass: 280.9 KG

Pressure relief opening:

Calculation- zone no:	Recommended area against overpressure		Max. flow [kg/s]
	Area [m ²]	Overpressure [mbar]	
1	0,318	6,0	10,50



Component list:

Nozzle-type	Number	C1	C2	C3	C4	C5	C6
1	9	-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	1,800
13	35,00	1 1/4	10,300
13	26,60	1	30,900

Number of bends (+) and elbows (-)

Bend-type	Di [mm]	DN	Number
-90	42,90	2	1
-90	35,00	1 1/4	4
-90	26,60	1	3

Number of T-distributors (in- and outdiameter)

Number	Input	90-out	90-out	0-out
2	35,0	35,0	0,0	35,0
3	35,0	26,6	0,0	26,6
3	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	281,9	0,0	0,00	300,0	1,0	1,0
1,9	239,7	15,0	8,39	248,3	59,9	22,6
2,1	237,6	15,7	8,23	242,4	58,5	22,1
2,4	235,6	16,4	8,07	236,8	57,1	21,6
2,6	233,6	17,1	8,12	231,5	57,4	21,8
2,9	231,6	17,9	7,98	226,3	56,1	21,3
3,1	229,6	18,5	7,83	221,3	54,8	20,8
3,4	227,7	19,2	7,69	216,6	53,6	20,4
3,6	225,8	19,9	7,55	212,0	52,5	20,0
4,1	222,1	21,2	7,41	205,9	51,4	19,6
4,6	218,4	22,5	7,43	199,3	51,3	19,6
5,1	214,8	23,8	7,24	192,5	49,7	18,9
7,1	200,8	28,8	6,91	171,8	46,9	18,0
9,1	188,1	33,3	6,21	150,7	41,4	15,9
11,0	176,3	37,5	5,70	131,7	37,2	14,4
16,0	152,1	46,0	4,35	97,6	27,3	10,6
21,0	133,0	52,8	3,52	78,0	21,5	8,4
26,0	117,0	58,5	2,99	66,0	18,0	7,1
31,0	103,7	63,2	2,52	58,1	15,1	6,0
36,0	91,9	67,4	2,26	52,1	13,5	5,3
41,0	81,6	71,1	1,90	47,3	11,3	4,5
46,0	72,6	74,2	1,73	43,4	10,4	4,1
51,0	64,4	77,1	1,57	39,8	9,5	3,8
56,0	57,0	79,8	1,43	36,4	8,7	3,5
61,0	50,6	82,1	1,21	33,5	7,5	3,0

Discharge meantime at nozzle:

53,7 s

