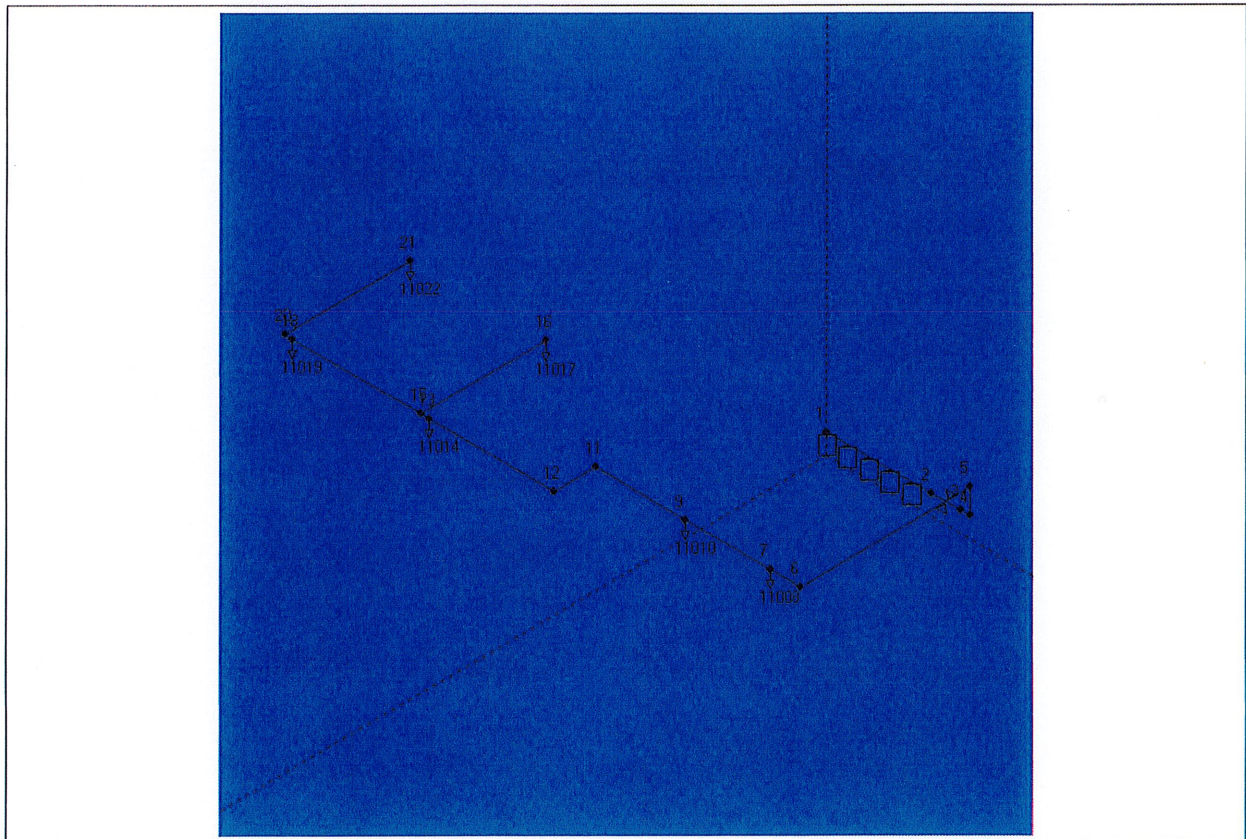




Project: 19IG021R0  
Project-No:  
Building: UPS / DATA CENTER  
Object:  
Contractor:  
Owner:  
Project engineer:  
Date: 17/12/2019  
Altitude above sealevel: 0 m  
Regulation rule for calculation of IG541 quantities: ISO 14520-1, Edition 2000  
  
Pipe catalogue: LPGDiametros.rkl  
Component catalogue: LPGComponentes.arm  
Nozzle catalogue: LPGDifusores.noz





### Pipesystem data:

Section- No:	Starting- node	Endnode Nozzle	Length [m]	Height [m]	Pipe type	Diameter [mm] **	Fitting *	Component code	coefficient	Nb of containers IG541 quantity
1	0	1	0,400	0,400	22	18,8	C	128	9,000	5,0
2	1	2	2,125	0,000	33	42,9	E	-	-	0,0
3	2	3	0,600	0,000	13	52,5	R	-	-	0,0
4	3	4	0,200	0,000	13	52,5		-	-	0,0
5	4	5	0,500	0,500	13	52,5	E	-	-	0,0
6	5	6	3,460	0,000	13	52,5	E	-	-	0,0
7	6	7	0,620	0,000	13	52,5	E	-	-	0,0
8	7	11008	0,200	-0,200	13	26,6	T-90°	-	-	0,0
9	7	9	1,710	0,000	13	52,5	T-0°	-	-	0,0
10	9	11010	0,200	-0,200	13	26,6	T-90°	-	-	0,0
11	9	11	1,850	0,000	13	40,9	T-0°	-	-	0,0
12	11	12	0,840	0,000	13	40,9	E	-	-	0,0
13	12	13	2,560	0,000	13	40,9	E	-	-	0,0
14	13	11014	0,200	-0,200	13	26,6	T-90°	-	-	0,0
15	13	15	0,150	0,000	13	26,6	T-0°	-	-	0,0
16	15	16	2,550	0,000	13	26,6	T-90°	-	-	0,0
17	16	11017	0,200	-0,200	13	26,6	E	-	-	0,0
18	15	18	2,630	0,000	13	26,6	T-0°	-	-	0,0
19	18	11019	0,200	-0,200	13	26,6	T-90°	-	-	0,0
20	18	20	0,150	0,000	13	26,6	T-0°	-	-	0,0
21	20	21	2,550	0,000	13	26,6	E	-	-	0,0
22	21	11022	0,200	-0,200	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]
11010	AMBIENTE	11,0
11008	AMBIENTE	11,0
11014	AMBIENTE	14,0
11017	AMBIENTE	14,0
11019	AMBIENTE	14,0
11022	AMBIENTE	14,0

**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	65,7	0,0	65,7	6,000	20,0	30,7	1,30	39,9	47,45
2 AMBIENTE	151,8	0,0	151,8	6,000	20,0	30,7	1,30	39,9	109,60

Regulation rule for calculation of IG541 quantities: ISO 14520-1, Edition 2000  
Altitude above sealevel: 0,0 m

#### IG541 storage input data:

Container volume: 80,0 l  
Container pressure: 300,0 bar abs  
Storage temperature: 15,0 °C  
Supplement factor: 1,00  
Minimum storage quantity: 157,05 kg  
Number of containers: 5

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:

### IG541 design data:

Design quantity:	157,05
Supplement factor:	1,00
Minimum storage quantity:	157,05
Container volume:	80,0 l
Container pressure:	300,0 bar abs
IG541-mass in one container:	33,1 kg
Number of containers:	5
Actual storage quantity:	165,3 kg
Storage temperature:	15,0 °C
Starting container pressure:	300,0 bar abs

### Discharge time:

Total discharge time of air and IG541:	40,6 s
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### System information:

Restrictor diameter:	14,0 mm
Container working pressure:	182,2 bar abs
Total network volume:	30,4 l

**Pipe system:**

Section- No:	Starting- node	Endnode Nozzle	Pressure [bar abs]	Temperature [°C]	Flowrate [kg/s]	Pipedimension Di [mm]	DN
1	0	1	179,08	-4,86	1,26	18,8	3/4
2	1	2	178,47	-4,93	6,32	42,9	2
3	2	3	39,67	-31,50	6,32	52,5	2
4	3	4	39,63	-31,52	6,32	52,5	2
5	4	5	39,01	-31,85	6,32	52,5	2
6	5	6	37,75	-32,55	6,32	52,5	2
7	6	7	37,09	-32,93	6,32	52,5	2
8	7	11008	36,11	-32,95	0,95	26,6	1
9	7	9	36,53	-33,08	5,36	52,5	2
10	9	11010	35,80	-33,10	0,95	26,6	1
11	9	11	35,53	-33,56	4,42	40,9	1 1/2
12	11	12	34,45	-34,24	4,42	40,9	1 1/2
13	12	13	32,54	-35,49	4,42	40,9	1 1/2
14	13	11014	31,01	-35,54	1,32	26,6	1
15	13	15	31,88	-35,66	3,10	26,6	1
16	15	16	26,31	-36,28	1,05	26,6	1
17	16	11017	25,90	-36,61	1,05	26,6	1
18	15	18	27,60	-37,98	2,05	26,6	1
19	18	11019	25,23	-38,03	1,02	26,6	1
20	18	20	26,87	-38,00	1,03	26,6	1
21	20	21	25,78	-38,85	1,03	26,6	1
22	21	11022	25,38	-39,18	1,03	26,6	1



**Nozzle data:**

Calculation- zone no:	Nozzle no.	Nozzle type	Number of orifices	Pipeconnection Di [mm]	DN	Orifice [mm]	IG541 out- put [kg]
1	11010	1	1	26,6	1	11,0	23,5
1	11008	1	1	26,6	1	11,0	23,7
2	11014	1	1	26,6	1	14,0	32,8
2	11017	1	1	26,6	1	14,0	26,1
2	11019	1	1	26,6	1	14,0	25,4
2	11022	1	1	26,6	1	14,0	25,7

MAX. TRANSPORT TIME DIFF. BETWEEN NOZZLES: 11022./ 11008. IS 0.27 S



### Concentrations:

Calculation- zone no:	Gascomposition after the discharge of the design quantity [%]			
	O2	CO2	AR	N2
1	12,6	3,2	16,7	67,5
2	12,5	3,2	16,8	67,5

Total flooded design quantity within discharge time: 157,05 kg

Calculation- zone no:	Gascomposition after total discharge [%]			
	O2	CO2	AR	N2
1	12,2	3,3	17,3	67,1
2	12,2	3,4	17,4	67,1

Total flooded IG541 mass: 164.7 KG

### Pressure relief opening:

Calculation- zone no:	Recommended area against overpressure		Max. flow [kg/s]
	Area [m²]	Overpressure [mbar]	
1	0,115	6,0	3,36
2	0,267	6,0	7,82





**Component list:**

Nozzle-type	Number	C1	C2	C3	C4	C5	C6
1	6	-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	2,100
13	52,50	2	7,100
13	26,60	1	9,000
13	40,90	1 1/2	5,300

**Number of bends (+) and elbows (-)**

Bend-type	Di [mm]	DN	Number
-90	42,90	2	1
-90	52,50	2	3
-90	40,90	1 1/2	2
-90	26,60	1	3

**Number of T-distributors (in- and outdiameter)**

Number	Input	90-out	90-out	0-out
1	52,5	26,6	0,0	52,5
1	52,5	26,6	0,0	40,9
1	40,9	26,6	0,0	26,6
2	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	165,3	0,0	0,00	300,0	1,0	1,0
1,5	123,9	25,0	8,44	218,7	55,9	41,3
1,7	121,8	26,3	8,18	208,5	53,5	39,3
2,0	119,9	27,5	7,84	199,4	51,0	37,5
2,2	118,0	28,6	7,54	191,3	48,8	35,9
2,5	116,2	29,7	7,27	184,2	46,8	34,5
2,7	114,4	30,8	7,03	177,7	45,1	33,3
3,0	112,7	31,8	6,82	171,9	43,5	32,1
3,2	111,1	32,8	6,62	166,5	42,1	31,1
3,5	109,4	33,8	6,44	161,5	40,8	30,1
4,0	106,3	35,7	6,26	154,6	39,6	29,2
4,5	103,2	37,5	6,16	147,2	39,0	29,0
5,0	100,3	39,3	5,93	140,0	37,1	27,5
7,5	87,0	47,4	5,04	112,7	31,0	23,1
9,5	77,8	52,9	4,42	94,3	26,8	20,0
11,0	69,8	57,8	3,83	79,3	23,0	17,3
16,0	54,1	67,3	2,73	54,9	16,0	12,0
21,0	42,7	74,2	2,03	41,0	11,8	8,9
26,0	33,9	79,5	1,58	32,0	9,1	6,9
31,0	27,0	83,7	1,26	25,6	7,3	5,5
36,0	21,5	87,0	1,00	20,9	5,8	4,4
41,0	17,1	89,6	0,81	17,2	4,8	3,7
46,0	13,6	91,7	0,66	15,4	4,0	3,1

Discharge meantime at nozzle:

40,6 s

