

Project:

Project-No:

Building:

Object:

Contractor:

Owner:

Project engineer:

Date:

Altitude above sealevel:

Regulation rule for calculation of FM200 quantities:

Budynek Neofilologii

Archiwum -1.9b

Uniwersytet Gdański

Krzysztof Filipowicz

2010-05-28

200 m

NFPA 2001 (edition 2000)

Pipe catalogue:

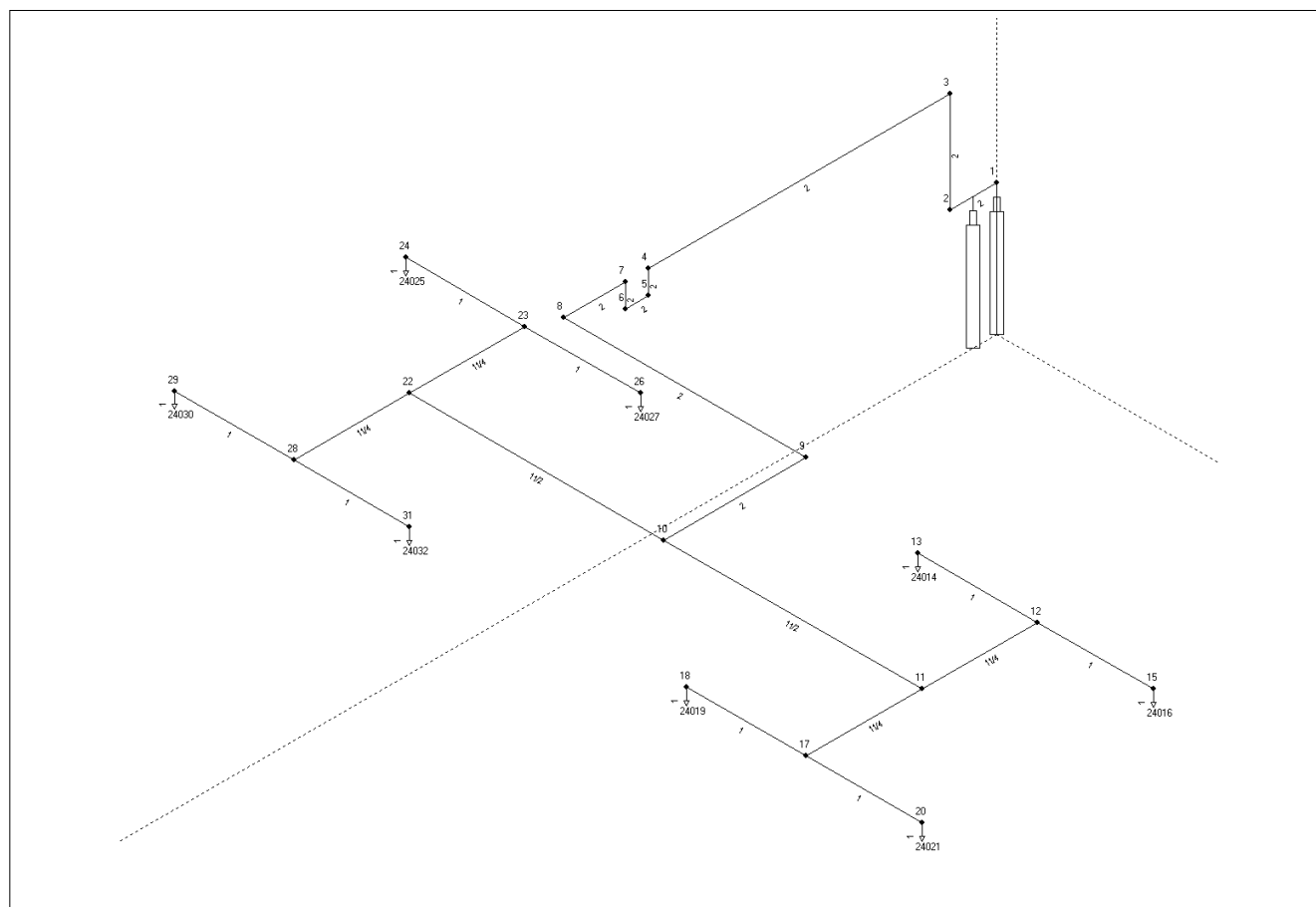
Component catalogue:

Nozzle catalogue:

DIN2458.rkl

Kidde_18.10.2004.arm

kidde_18.10.2004.noz



Pipesystem data:

Section-No:	Starting-node	Endnode	Length [m]	Height [m]	Pipetype	Diameter [mm] **	Fitting *	Component code	Component coefficient	Nb of containers FM200 quantity
1	0	1	1,700	1,700	20	46,8		-	142,0000	2,0
2	1	2	0,600	0,000	11	53,1	E	-	-	0,0
3	2	3	1,300	1,300	11	53,1	E	-	-	0,0
4	3	4	3,920	0,000	11	53,1	E	-	-	0,0
5	4	5	0,300	-0,300	11	53,1	E	-	-	0,0
6	5	6	0,300	0,000	11	53,1	E	-	-	0,0
7	6	7	0,300	0,300	11	53,1	E	-	-	0,0
8	7	8	0,800	0,000	11	53,1	E	-	-	0,0
9	8	9	3,150	0,000	11	53,1	E	-	-	0,0
10	9	10	1,850	0,000	11	53,1	E	-	-	0,0
11	10	11	3,350	0,000	11	41,9	T-90°	-	-	0,0
12	11	12	1,500	0,000	11	36,0	T-90°	-	-	0,0
13	12	13	1,550	0,000	11	27,3	T-90°	-	-	0,0
14	13	24014	0,100	-0,100	11	27,3	E	-	-	0,0
15	12	15	1,500	0,000	11	27,3	T-90°	-	-	0,0
16	15	24016	0,100	-0,100	11	27,3	E	-	-	0,0
17	11	17	1,500	0,000	11	36,0	T-90°	-	-	0,0
18	17	18	1,550	0,000	11	27,3	T-90°	-	-	0,0
19	18	24019	0,100	-0,100	11	27,3	E	-	-	0,0
20	17	20	1,500	0,000	11	27,3	T-90°	-	-	0,0
21	20	24021	0,100	-0,100	11	27,3	E	-	-	0,0
22	10	22	3,300	0,000	11	41,9	T-90°	-	-	0,0
23	22	23	1,500	0,000	11	36,0	T-90°	-	-	0,0
24	23	24	1,550	0,000	11	27,3	T-90°	-	-	0,0
25	24	24025	0,100	-0,100	11	27,3	E	-	-	0,0
26	23	26	1,500	0,000	11	27,3	T-90°	-	-	0,0
27	26	24027	0,100	-0,100	11	27,3	E	-	-	0,0
28	22	28	1,500	0,000	11	36,0	T-90°	-	-	0,0
29	28	29	1,550	0,000	11	27,3	T-90°	-	-	0,0
30	29	24030	0,100	-0,100	11	27,3	E	-	-	0,0
31	28	31	1,500	0,000	11	27,3	T-90°	-	-	0,0
32	31	24032	0,100	-0,100	11	27,3	E	-	-	0,0

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

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

Legend of pipetypes

Type	Pipeclass	Pipe roughness
20	RURKI SYFONOWE	smooth
11	RURY ST. O.C. wg DIN2458	galvanized

**Nozzle data:**

No.	Calculation zone	Diameter [mm]
24014	-1.9b Archiwum instalacja dol rz	0,0
24016	-1.9b Archiwum instalacja dol rz	0,0
24021	-1.9b Archiwum instalacja dol rz	0,0
24019	-1.9b Archiwum instalacja dol rz	0,0
24025	-1.9b Archiwum instalacja dol rz	0,0
24027	-1.9b Archiwum instalacja dol rz	0,0
24030	-1.9b Archiwum instalacja dol rz	0,0
24032	-1.9b Archiwum instalacja dol rz	0,0

Legend of nozzles:

Type	Number of orifices	C1	C2	C3	C4	C5	C6
2 KD-200/42 bar: 1/2"	4	1,000	0,112	-0,034	-0,034	-4,338	1,947

Calculation zone data:**Calculation of design quantity:**

Zone	Total volume [m3]	Volume of building parts [m3]	Calculated volume [m3]	Total surface [m2]	Max. Over- pressure [mbar]	Design temp. [°C]	Extinguish- conc. [% Vol]	Design factor	Design conc. [% Vol]	Design quantity [kg]
1 -1.9b Archiwum in:280,0ja dc0,0:			280,0	0,0	2,000	20,0	6,6	1,20	7,9	175,41

Regulation rule for calculation of FM200 quantities: NFPA 2001 (edition 2000)

Altitude above sealevel: 200,0 m

FM200 storage input data:

Container volume:	140,0 l
Filling ratio:	1,050 kg/l
Filling pressure:	43,0 bar abs
Storage temperature:	15,0 °C
Supplement factor:	1,02
Minimum storage quantity:	178,91 kg
Number of containers:	2

Discharge time (input value): 9,5 s

Further information:

Design with included gas discharge time

Calculation results:

FM200 storage data:

Design quantity:	175,4 kg
Supplement factor:	1,02
Minimum storage quantity:	178,9 kg
Container volume:	140,0 l
Filling ratio:	0,64 kg/l
Filling pressure:	43,0 bar abs
FM200 -mass per container:	89,5 kg
Number of containers:	2
Actual storage quantity:	178,9 kg
Storage temperature:	15,0 °C
Starting container pressure:	41,8 bar abs

Discharge time:

Discharge time air:	0,3 s
Total gas discharge time:	0,3 s
Two-phase discharge time:	9,2 s
Total discharge time:	9,5 s

System information:

Container working pressure:	24,9 bar abs
Container working temperature:	14,1 °C
Total network volume:	51,7 l
Medium pipe content:	46,3 kg FM200
Filling portion in pipe system:	0,26 kg FM200 /kg FM200 -storage

Pipe system:

Section- No:	Starting- node	Endnode	Pressure [bar abs]	Flowrate [kg/s]	Pipedimension Di [mm]	DN
1	0	1	22,84	9,03	46,8	--
2	1	2	22,26	18,06	53,1	2
3	2	3	21,48	18,06	53,1	2
4	3	4	20,66	18,06	53,1	2
5	4	5	20,06	18,06	53,1	2
6	5	6	19,42	18,06	53,1	2
7	6	7	18,71	18,06	53,1	2
8	7	8	17,98	18,06	53,1	2
9	8	9	17,07	18,06	53,1	2
10	9	10	16,19	18,06	53,1	2
11	10	11	15,32	9,03	41,9	11/2
12	11	12	14,76	4,51	36,0	11/4
13	12	13	14,43	2,26	27,3	1
14	13	24014	14,18	2,26	27,3	1
15	12	15	14,44	2,26	27,3	1
16	15	24016	14,18	2,26	27,3	1
17	11	17	14,76	4,51	36,0	11/4
18	17	18	14,43	2,26	27,3	1
19	18	24019	14,18	2,26	27,3	1
20	17	20	14,44	2,26	27,3	1
21	20	24021	14,18	2,26	27,3	1
22	10	22	15,32	9,03	41,9	11/2
23	22	23	14,76	4,51	36,0	11/4
24	23	24	14,44	2,26	27,3	1
25	24	24025	14,19	2,26	27,3	1
26	23	26	14,44	2,26	27,3	1
27	26	24027	14,19	2,26	27,3	1
28	22	28	14,76	4,51	36,0	11/4
29	28	29	14,44	2,26	27,3	1
30	29	24030	14,19	2,26	27,3	1
31	28	31	14,44	2,26	27,3	1
32	31	24032	14,19	2,26	27,3	1

Nozzle data:

Calculation- zone no:	Nozzle no.	Nozzle type	Number of orifices	Pipeconnection Di [mm]	DN	Orifice [mm]	FM200 out- put [kg]
1	24014	2	4	27,3	1	6,2	21,9
1	24016	2	4	27,3	1	6,2	21,9
1	24021	2	4	27,3	1	6,2	21,9
1	24019	2	4	27,3	1	6,2	21,9
1	24025	2	4	27,3	1	6,2	21,9
1	24027	2	4	27,3	1	6,2	21,9
1	24030	2	4	27,3	1	6,2	21,9
1	24032	2	4	27,3	1	6,2	21,9

Two-phase discharge time: 9,2 s

Released two-phase FM200 : 175,4 kg

MAXIMUM TRANSPORT TIME DIFF. BETWEEN NOZZLES: 24027./ 24019. IS 0.03 S

Calculation- zone no:	Nozzle no.	Outlet velocity [m/s]	Transport time [s]	Jetdistance [m]
1	24014	27,6	2,79	3,50
1	24016	27,6	2,77	3,50
1	24021	27,6	2,77	3,50
1	24019	27,6	2,79	3,50
1	24025	27,5	2,78	3,50
1	24027	27,5	2,76	3,50
1	24030	27,5	2,78	3,50
1	24032	27,5	2,76	3,50

**Concentrations:**

Calculation- zone no:	O2	Gascomposition after discharge [%]	
		FM200	N2
1	19,2	8,0	71,9

Pressure relief opening:

Calculation- zone no:	Recommended area against overpressure	
	Area [m ²]	Overpressure [mbar]
1	0,224	2,0

Component list:

Component	Number	Code	Coefficient
cylinder valves KD-2	1	142	16,000

Nozzle-type	Number	C1	C2	C3	C4	C5	C6
2	8	1,000	0,112	-0,034	-0,034	-4,340	1,950

Pipe-type	Di [mm]	DN	Length [m]
20	46,80		1,700
11	53,10	2	12,500
11	41,90	11/2	6,700
11	36,00	11/4	6,000
11	27,30	1	13,200

Number of bends (+) and elbows (-)

Bend-type	Di [mm]	DN	Number
-90	53,10	2	9
-90	27,30	1	8

Number of T-distributors (in- and outdiameter)

Number	Input	90-out	90-out	0-out
1	53,1	41,9	41,9	0,0
2	41,9	36,0	36,0	0,0
4	36,0	27,3	27,3	0,0