

3. Proračuni

1. PODACI ZA PRORAČUN PREMA VdS CEA 4001 STANDARDU

- | | |
|--|-------------------------|
| ➤ Štićeni prostor: | Garaža |
| ➤ Tip sustava: | Suhi |
| ➤ Požarna opasnost | OH2 |
| ➤ Vrijeme djelovanja sprinkler sustava | 40 min |
| ➤ Površina djelovanja | 180 m ² |
| ➤ Specifično polijevanje | 5 l/min, m ² |
| ➤ Dozvoljeno prekrivanje jedne sprinkler mlaznice na stropnoj mreži: | 12 m ² |
| ➤ Maksimalni razmak između dvije mlaznice | 4 m |

2. PRORAČUN PADA TLAKA U CJEVOVODU

Za proračun pada tlaka koristi se, prema VdS propisima formula Hazen-Williamsa:

$$p = 6,05 \cdot 10^5 \cdot d^{-4,87} \cdot Q^{1,85} \cdot C^{-1,85} \cdot l \quad [bar]$$

- | | | |
|---|---|---|
| p | – | pad tlaka [bar] |
| Q | – | protok vode [l/min] |
| C | – | konstanta (za čelične cjevi C=120) |
| d | – | unutarnji promjer cjevi [mm] |
| l | – | stvarna + ekvivalentna dužina cjevi [m] |

Na slijedećim stranicama nalazi se hidraulički proračun:

PRORAČUN - GARAŽA

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Dieburger Str. 80										COMMODITY :					
6100 Darmstadt										CLASSIFIC. :					
IN										LOCATION OF OPERATION AREA					
PROJECTNR.:										STORAGE HEIGHT					
CLIENT :										CEILING PROTECTION:					
MM/MIN										RACK PROTECTION :					
MM/MIN										TYPE OF SYSTEM : DRY					
BUILDING : Hotel Milan										HAZARD CLASS : OH2					
LOCATION :										AREA : Garaza					
QM										DRAWING NO.:					
ORDER NO. :										DENSITY					
QM										CEILING PROTECTION:					
AREA :										RACK PROTECTION :					
OPERATION AREA										AREA OF OPERATION					
ENGINEER :										CEILING PROTECTION:					
DATE :										RACK PROTECTION :					
0										MAX. PROTECTION AREA/SPRINKLER					
										CEILING PROTECTION:					
										RACK PROTECTION :					
										OPERATION AREA NO.:					
LEGEND EQUIVALENT LENGTH: AV = ALARMVALVE, T = TEE, L = ELBOW/LONG RAD. ELBOW, V = VALVE, CV = CHECK VALVE															
PIPE	REF.- P-	K-	FLOW	TOTAL	PIPE	PIPE-	EQUIVALENT	LENGTH	TOTAL	VEL	FRICITION	FRIC.			
STATIC	P- REF.				DN	LENGTH	AV/	T	L	V	CV	LOSS/M	LOSS		
SECT.	POINT START	SPR.	SPR.	FLOW	MM	M	OTHER		M	M/S	BAR/M	BAR			
HEIGHT	END POINT			L/MIN											
NO.	START BAR			L/MIN											
BAR	BAR END														
R 1- 1	14 0.590	0.	0.0	260.8	32	6.35			8.15	4.3	0.0680	0.5539			
0.00 1.144	13														
+							1.8								
R 1- 0	55 0.584	80.	61.1	61.1	20	0.04			0.04	2.8	0.0551	0.0022			
0.00 0.590	14														
R 1- 2	21 0.466	0.	0.0	199.7	32	3.00			3.00	3.3	0.0415	0.1244			
0.00 0.590	14														
R 1- 0	51 0.460	80.	54.3	54.3	20	0.04			0.04	2.5	0.0442	0.0018			
0.00 0.466	21														
R 1- 3	9 0.397	0.	0.0	145.4	32	3.00			3.00	2.4	0.0231	0.0692			
0.00 0.466	21														
R 1- 0	47 0.391	80.	50.0	50.0	20	0.04			0.04	2.3	0.0380	0.0015			
0.00 0.397	9														
R 1- 4	7 0.365	0.	0.0	95.4	32	3.00			3.00	1.6	0.0106	0.0317			
0.00 0.397	9														
R 1- 0	43 0.360	80.	48.0	48.0	20	0.04			0.04	2.2	0.0352	0.0014			
0.00 0.365	7														
R 1- 5	8 0.356	0.	0.0	47.4	32	3.00			3.00	0.8	0.0029	0.0087			
0.00 0.365	7														
R 1- 0	39 0.351	80.	47.4	47.4	20	0.04			0.04	2.2	0.0344	0.0014			
0.00 0.356	8														
R 2- 1	20 0.594	0.	0.0	261.7	32	6.35			8.15	4.3	0.0684	0.5574			
0.00 1.152	19														
+							1.8								
R 2- 0	58 0.588	80.	61.4	61.4	20	0.04			0.04	2.8	0.0555	0.0022			
0.00 0.594	20														
R 2- 2	24 0.469	0.	0.0	200.4	32	3.00			3.00	3.3	0.0417	0.1252			
0.00 0.594	20														
R 2- 0	54 0.463	80.	54.5	54.5	20	0.04			0.04	2.5	0.0445	0.0018			
0.00 0.469	24														
R 2- 3	12 0.399	0.	0.0	145.9	32	3.00			3.00	2.4	0.0232	0.0696			
0.00 0.469	24														
R 2- 0	50 0.394	80.	50.2	50.2	20	0.04			0.04	2.3	0.0383	0.0015			
0.00 0.399	12														
R 2- 4	5 0.368	0.	0.0	95.7	32	3.00			3.00	1.6	0.0106	0.0319			
0.00 0.399	12														
R 2- 0	46 0.362	80.	48.1	48.1	20	0.04			0.04	2.2	0.0354	0.0014			
0.00 0.368	5														
R 2- 5	6 0.359	0.	0.0	47.6	32	3.00			3.00	0.8	0.0029	0.0088			
0.00 0.368	5														
R 2- 0	42 0.353	80.	47.6	47.6	20	0.04			0.04	2.2	0.0346	0.0014			
0.00 0.359	6														
R 3- 1	18 0.608	0.	0.0	264.9	32	6.35			8.15	4.4	0.0699	0.5700			
0.00 1.178	17														
+							1.8								
R 3- 0	57 0.602	80.	62.1	62.1	20	0.04			0.04	2.8	0.0567	0.0023			
0.00 0.608	18														
R 3- 2	23 0.480	0.	0.0	202.8	32	3.00			3.00	3.3	0.0427	0.1280			
0.00 0.608	18														
R 3- 0	53 0.475	80.	55.1	55.1	20	0.04			0.04	2.5	0.0455	0.0018			
0.00 0.480	23														
R 3- 3	11 0.409	0.	0.0	147.7	32	3.00			3.00	2.4	0.0237	0.0712			
0.00 0.480	23														
R 3- 0	49 0.404	80.	50.8	50.8	20	0.04			0.04	2.3	0.0392	0.0016			
0.00 0.409	11														

R 3- 4	3	0.377	0.	0.0	96.9	32	3.00							3.00	1.6	0.0109	0.0326
0.00 0.409	11																
R 3- 0	45	0.371	80.	48.7	48.7	20	0.04							0.04	2.2	0.0362	0.0014
0.00 0.377	3																
R 3- 5	4	0.368	0.	0.0	48.2	32	3.00							3.00	0.8	0.0030	0.0090
0.00 0.377	3																
R 3- 0	41	0.362	80.	48.2	48.2	20	0.04							0.04	2.2	0.0354	0.0014
0.00 0.368	4																
R 4- 1	16	0.639	0.	0.0	271.6	32	6.35							8.15	4.5	0.0732	0.5969
0.00 1.236	15																
+																	
R 4- 0	56	0.632	80.	63.6	63.6	20	0.04							0.04	2.9	0.0593	0.0024
0.00 0.639	16																
R 4- 2	22	0.505	0.	0.0	208.0	32	3.00							3.00	3.4	0.0447	0.1341
0.00 0.639	16																
R 4- 0	52	0.499	80.	56.5	56.5	20	0.04							0.04	2.6	0.0476	0.0019
0.00 0.505	22																
R 4- 3	10	0.430	0.	0.0	151.5	32	3.00							3.00	2.5	0.0249	0.0746
0.00 0.505	22																
R 4- 0	48	0.424	80.	52.1	52.1	20	0.04							0.04	2.4	0.0410	0.0016
0.00 0.430	10																
R 4- 4	1	0.396	0.	0.0	99.4	32	3.00							3.00	1.6	0.0114	0.0342
0.00 0.430	10																
R 4- 0	44	0.390	80.	50.0	50.0	20	0.04							0.04	2.3	0.0380	0.0015
0.00 0.396	1																
R 4- 5	2	0.386	0.	0.0	49.4	32	3.00							3.00	0.8	0.0031	0.0094
0.00 0.396	1																
R 4- 0	40	0.381	80.	49.4	49.4	20	0.04							0.04	2.2	0.0371	0.0015
0.00 0.386	2																

1.8

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Dieburger Str. 80
6100 Darmstadt

PROJECTNR.: BUILDING : Hotel Milan AREA :
CLIENT : LOCATION : ENGINEER :
ORDER NO. : DATE :
LEGEND EQUIVALENT LENGTH: AV = ALARMVALVE, T = TEE, L = ELBOW/LONG RAD. ELBOW, V = VALVE, CV = CHECK VALVE

PIPE STATIC SECT. HEIGHT NO. BAR	REF.- P- P- REF. POINT START END POINT START BAR BAR END	K- SPR.	FLOW SPR. L/MIN	TOTAL FLOW L/MIN	PIPE DN MM	PIPE- LENGTH M	EQUIVALENT LENGTH AV/ T L V CV OTHER	TOTAL LENGTH M	VEL M/S	FRICTION LOSS/M BAR/M	FRIC. LOSS BAR
V 1- 1	13 1.144	0.	0.0	0.0	65	20.00		20.00	0.0	0.0000	0.0000
0.00 1.144	25										
V 1- 2	19 1.152	0.	0.0	-260.8	65	3.00		3.00	1.1	-0.0025	-0.0074
0.00 1.144	13										
V 1- 3	17 1.178	0.	0.0	-522.6	65	3.00		3.00	2.2	-0.0089	-0.0268
0.00 1.152	19										
V 1- 4	15 1.236	0.	0.0	-787.5	65	3.00		3.00	3.3	-0.0191	-0.0573
0.00 1.178	17										
V 1- 5	26 1.454	0.	0.0	-1059.1	65	6.60		6.60	4.5	-0.0330	-0.2179
0.00 1.236	15										
V 2- 1	27 1.606	0.	0.0	-1059.1	65	2.20		4.60	4.5	-0.0330	-0.1519
0.00 1.454	26										
+											
H 1- 1	28 1.988	0.	0.0	-1059.1	80	1.80		13.50	3.3	-0.0152	-0.2057 -
0.18 1.606	27										
+											
+											
+											
Z 1- 1	29 2.003	0.	0.0	-1059.1	100	1.00		2.80	2.2	-0.0056	-0.0156
0.00 1.988	28										
+											
Z 1- 2	30 1.847	0.	0.0	-1059.1	100	1.80		3.60	2.2	-0.0056	-0.0200
0.18 2.003	29										
+											
Z 1- 3	31 1.911	0.	0.0	-1059.1	100	2.50		11.50	2.2	-0.0056	-0.0640
0.00 1.847	30										
+											
+											
+											
Z 1- 4	32 1.924	0.	0.0	-1059.1	100	0.50		2.30	2.2	-0.0056	-0.0128
0.00 1.911	31										
+											
Z 2- 1	33 2.079	0.	0.0	-1059.1	100	1.50		1.50	2.2	-0.0056	-0.0083 -
0.15 1.924	32										
Z 3- 1	34 2.149	0.	0.0	-1059.1	50	0.30		0.30	8.0	-0.1362	-0.0409 -
0.03 2.079	33										
Z 4- 1	35 2.156	0.	0.0	-1059.1	65	0.20		0.20	4.5	-0.0330	-0.0066
0.00 2.149	34										
Z 5- 1	36 2.170	0.	0.0	-1059.1	100	0.80		2.60	2.2	-0.0056	-0.0145
0.00 2.156	35										
+											
Z 5- 2	37 2.196	0.	0.0	-1059.1	100	2.20		4.60	2.2	-0.0056	-0.0256
0.00 2.170	36										
+											
+											
+											

Z 5- 3 38 2.279 0. 0.0 -1059.1 100 0.80 0.80 2.2 -0.0056 -0.0045 -
0.08 2.196 37
THE SPRINKLER WITH THE LOWEST FLOWING RATE LIES ON SPRINKLER PIPE 1, WITH THE NR. 5

3. ZAHTJEV ZA IZVOR VODE

Proračunska površina:	Garaža
Potrebna količina vode – proračunska količina: l/min	1059,1
Potreban tlak – proračunski:	2,15 bar
Vrijeme gašenja sprinkler sustavom iznosi:	40 minuta
Potrebna akumulacija vode: min	1059,1 l/min x 40 = 42,36 m ³

Odabran akumulacijski spremnik 50 m³.

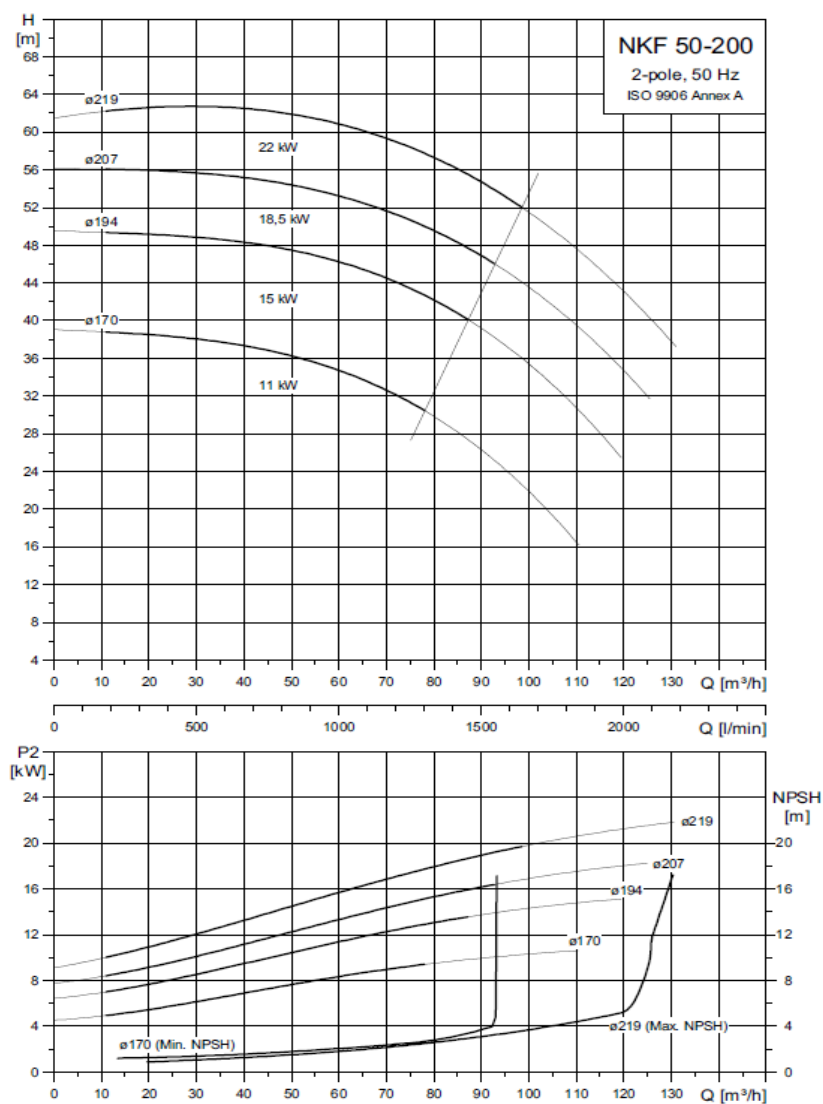
4. ODABIR SPRINKLER PUMPE

Izvor vode sukladno VdS:	1 elektro pumpa
Odabrana pumpa:	Grundfos NKF 50-200, Ø170
Snaga pumpe:	11 kW
Priključak električne energije sprinkler sustava potrebno je izvesti prije glavne sklopke građevine.	
Q-h dijagram pumpe nalazi se u prilogu.	

Performance curves

NKF 50-200
2-pole

NKF 50-200, 2-pole



Circulation flow 2 % of rated flow.

NKF 50-200		
> ø207 ≤ ø219	22 kW	2950 rpm
> ø194 ≤ ø207	18.5 kW	2940 rpm
> ø170 ≤ ø194	15 kW	2940 rpm
= ø170	11 kW	2930 rpm

Projektant:
Milovan Kuzmanić dipl.ing.str.