

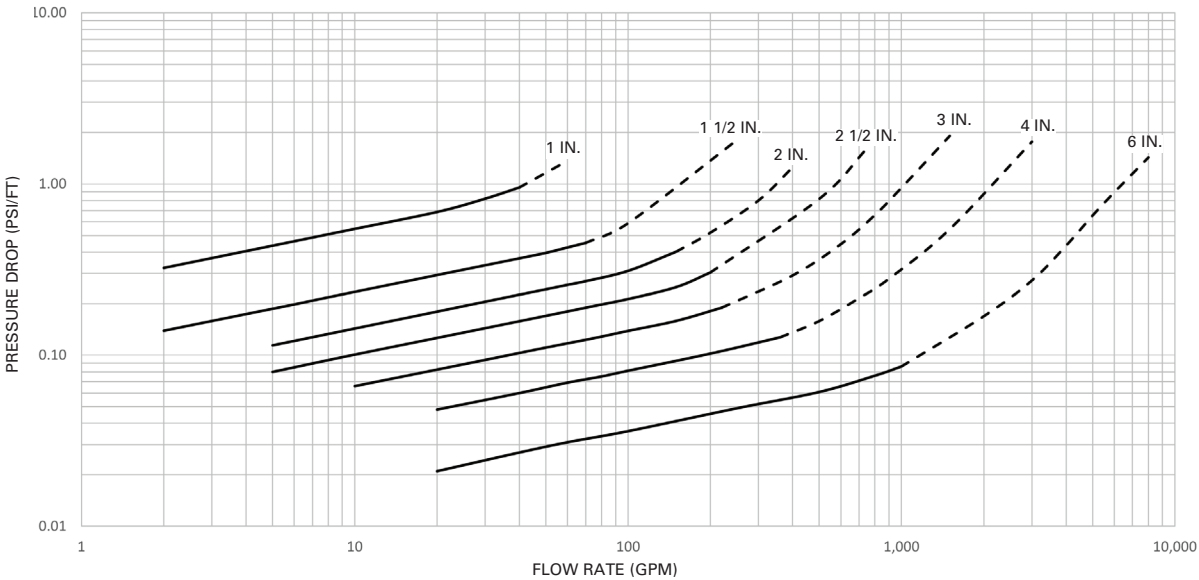
Friction Loss Data for CHEMGUARD Non-Fluorinated Foam Concentrates

Friction loss data for NFF-331 Non-fluorinated Foam Concentrate

Table 1-1: NFF-331 Non-Fluorinated Foam Concentrate Pressure Drop vs Flow Rate - Schedule 40 Pipe

NFF-331 Foam Concentrate													
1 in.		1 1/2 in.		2 in.		2 1/2 in.		3 in.		4 in.		6 in.	
GPM	PSI/FT	GPM	PSI/FT	GPM	PSI/FT	GPM	PSI/FT	GPM	PSI/FT	GPM	PSI/FT	GPM	PSI/FT
2	0.323	2	0.139	5	0.114	5	0.080	10	0.066	20	0.048	20	0.021
4	0.405	4	0.174	10	0.143	10	0.101	30	0.094	40	0.060	40	0.027
6	0.462	6	0.198	30	0.205	30	0.144	50	0.111	60	0.069	60	0.031
8	0.508	8	0.218	50	0.242	50	0.170	75	0.126	80	0.075	100	0.036
10	0.546	20	0.294	60	0.257	75	0.194	100	0.139	100	0.081	250	0.049
20	0.685	40	0.368	70	0.270	100	0.213	150	0.159	200	0.102	500	0.061
30	0.819	50	0.396	100	0.310	150	0.250	220	0.190	360	0.127	800	0.076
40	0.952	60	0.426	150	0.401	200	0.304	400	0.293	500	0.158	1,000	0.086
60	1.360	70	0.453	200	0.518	500	0.818	600	0.446	700	0.215	2,000	0.169
		100	0.590	300	0.799	750	1.623	800	0.661	900	0.279	3,000	0.273
		250	1.799	400	1.247			1,000	0.953	1,500	0.543	4,000	0.436
								1,500	1.910	3,000	1.763	5,000	0.654
												6,000	0.893
												8,000	1.428

Figure 1-1: NFF-331 Non-Fluorinated Foam Concentrate Pressure Drop vs Flow Rate - Schedule 40 Pipe



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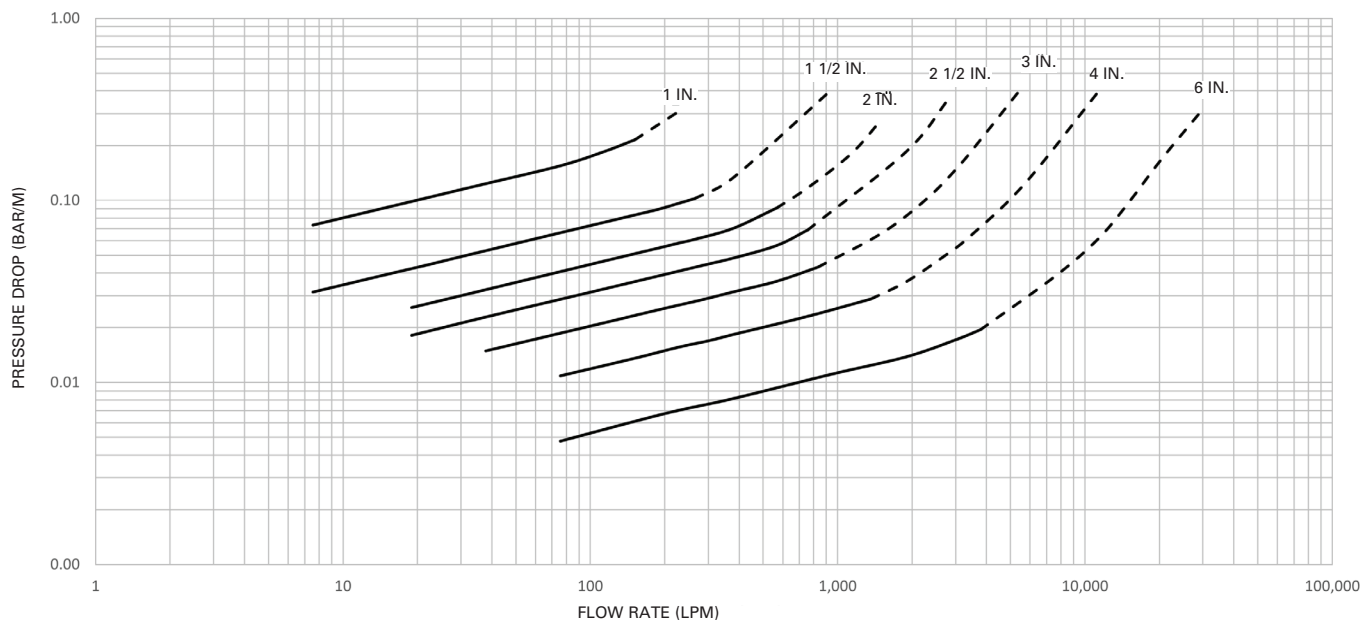
Note: Above figure is a graphical representation of the data in Table 1-1. Dashed lines represent the turbulent flow area. Johnson Controls recommends upsizing of pipe when system concentrate flow gets into this area. The data above is valid for pipe equivalent lengths up to 400 ft. The data above is applicable across the UL Listed temperature range of the foam concentrate.

Friction Loss Data for NFF-331 Non-Fluorinated Foam Concentrate (Metric)

Table 1-2: NFF-331 Non-Fluorinated Foam Concentrate Pressure Drop vs Flow Rate - Schedule 40 Pipe (Metric)

NFF-331 Foam concentrate (Metric)													
1 in.		1 1/2 in.		2 in.		2 1/2 in.		3 in.		4 in.		6 in.	
LPM	BAR/M	LPM	BAR/M	LPM	BAR/M	LPM	BAR/M	LPM	BAR/M	LPM	BAR/M	LPM	BAR/M
8	0.073	8	0.031	19	0.026	19	0.018	38	0.015	76	0.011	76	0.005
15	0.092	15	0.039	38	0.032	38	0.023	114	0.021	151	0.014	151	0.006
23	0.105	23	0.045	114	0.046	114	0.033	189	0.025	227	0.016	227	0.007
30	0.115	30	0.049	189	0.055	189	0.038	284	0.029	303	0.017	379	0.008
38	0.124	76	0.067	227	0.058	284	0.044	379	0.031	379	0.018	946	0.011
76	0.155	151	0.083	265	0.061	379	0.048	568	0.036	757	0.023	1,893	0.014
114	0.185	189	0.090	379	0.070	568	0.057	833	0.043	1,363	0.029	3,028	0.017
151	0.215	227	0.096	568	0.091	757	0.069	1,514	0.066	1,893	0.036	3,785	0.019
227	0.308	265	0.102	757	0.117	1,893	0.185	2,271	0.101	2,650	0.049	7,571	0.038
		379	0.133	1,136	0.181	2,839	0.367	3,028	0.150	3,407	0.063	11,356	0.062
		946	0.407	1,514	0.282			3,785	0.216	5,678	0.123	15,142	0.099
								5,678	0.432	11,356	0.399	18,927	0.148
												22,712	0.202
												30,283	0.323

Figure 1-2: NFF-331 Non-Fluorinated Foam Concentrate Pressure Drop vs Flow Rate - Schedule 40 Pipe (Metric)



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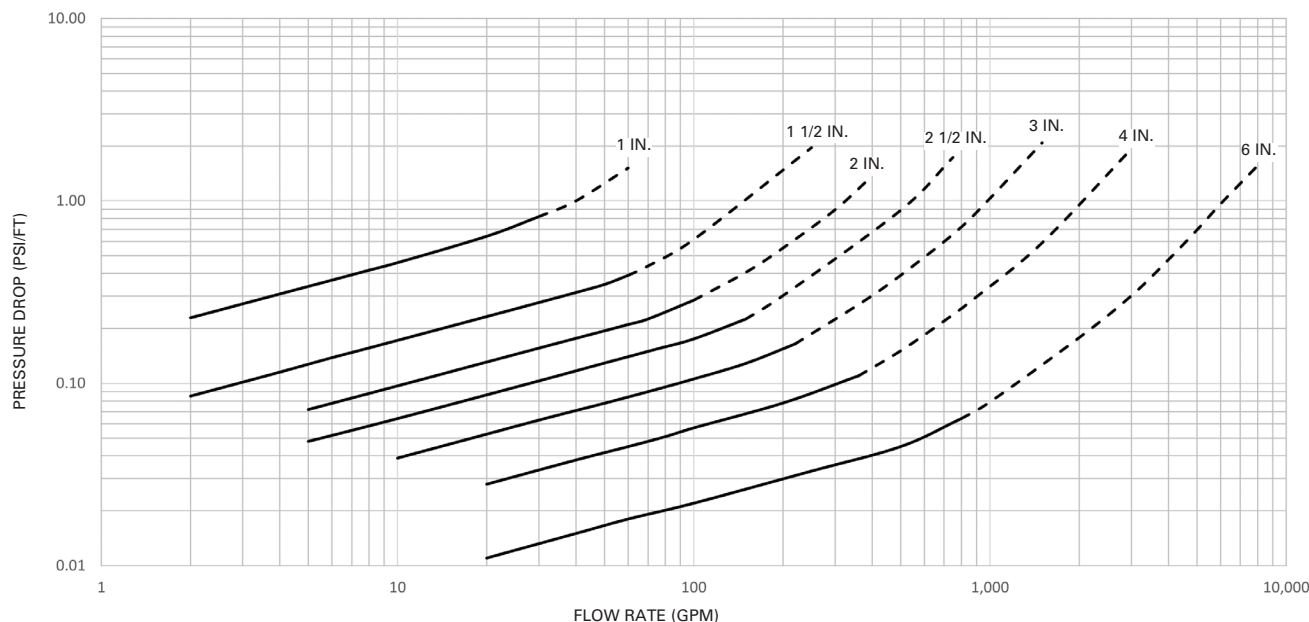
Note: Above figure is a graphical representation of the data in Table 1-2. Dashed lines represent the turbulent flow area. Johnson Controls recommends upsizing of pipe when system concentrate flow gets into this area. The data above is valid for pipe equivalent lengths up to 122 m. The data above is applicable across the UL Listed temperature range of the foam concentrate.

Friction Loss Data for NFF 3x3 UL201 Non-Fluorinated Foam Concentrate

Table 2-1: NFF 3x3 UL201 Non-Fluorinated Foam Concentrate Pressure Drop Vs Flow Rate - Schedule 40 Pipe

NFF 3x3 UL201 Foam Concentrate													
1 in.		1 1/2 in.		2 in.		2 1/2 in.		3 in.		4 in.		6 in.	
GPM	PSI/FT	GPM	PSI/FT	GPM	PSI/FT	GPM	PSI/FT	GPM	PSI/FT	GPM	PSI/FT	GPM	PSI/FT
2	0.229	2	0.085	5	0.072	5	0.048	10	0.039	20	0.028	20	0.011
4	0.309	4	0.115	10	0.097	10	0.064	30	0.063	40	0.038	40	0.015
6	0.368	6	0.138	30	0.156	30	0.103	50	0.078	60	0.045	60	0.018
8	0.417	8	0.156	50	0.194	50	0.129	75	0.093	80	0.051	100	0.022
10	0.459	20	0.232	60	0.210	75	0.154	100	0.106	100	0.057	250	0.033
20	0.640	40	0.314	70	0.225	100	0.175	150	0.129	200	0.078	500	0.045
30	0.820	50	0.348	100	0.285	150	0.225	220	0.165	360	0.110	800	0.064
40	1.001	60	0.390	150	0.406	200	0.302	400	0.303	500	0.151	1,000	0.079
60	1.518	70	0.439	200	0.552	500	0.890	600	0.492	700	0.220	2,000	0.178
		100	0.614	300	0.897	750	1.733	800	0.719	900	0.298	3,000	0.302
		250	1.960	400	1.376			1,000	1.033	1,500	0.590	4,000	0.476
								1,500	2.081	3,000	1.929	5,000	0.694
												6,000	0.963
												8,000	1.558

Figure 2-1: NFF 3x3 UL201 Non-Fluorinated Foam Concentrate Pressure Drop Vs Flow Rate - Schedule 40 Pipe



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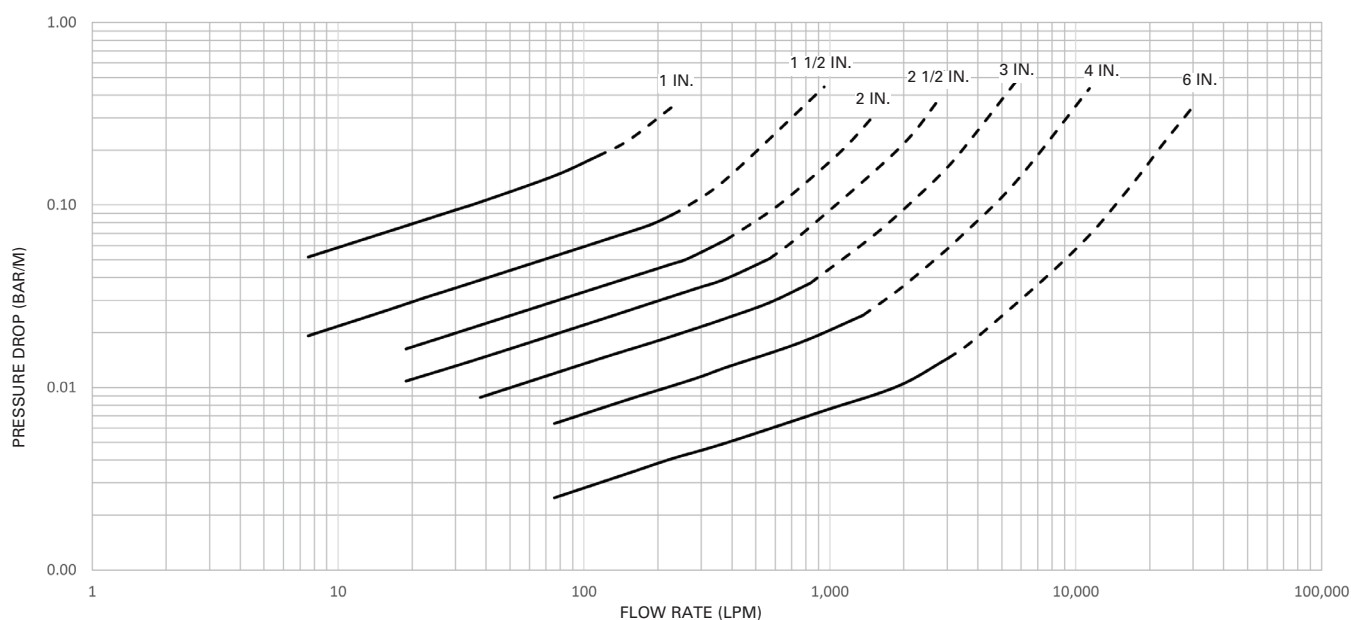
Note: Above figure is a graphical representation of the data in Table 2-1. Dashed lines represent the turbulent flow area. Johnson Controls recommends upsizing of pipe when system concentrate flow gets into this area. The data above is valid for pipe equivalent lengths up to 400 ft. The data above is applicable across the UL Listed temperature range of the foam concentrate.

Friction Loss Data for NFF 3x3 UL201 Non-Fluorinated Foam Concentrate (Metric)

Table 2-2: NFF 3x3 UL201 Non-Fluorinated Foam Concentrate Pressure Drop Vs Flow Rate - Schedule 40 Pipe (Metric)

NFF 3x3 UL201 Foam Concentrate													
1 in.		1 1/2 in.		2 in.		2 1/2 in.		3 in.		4 in.		6 in.	
LPM	BAR/M	LPM	BAR/M	LPM	BAR/M	LPM	BAR/M	LPM	BAR/M	LPM	BAR/M	LPM	BAR/M
8	0.052	8	0.019	19	0.016	19	0.011	38	0.009	76	0.006	76	0.002
15	0.070	15	0.026	38	0.022	38	0.014	114	0.014	151	0.009	151	0.003
23	0.083	23	0.031	114	0.035	114	0.023	189	0.018	227	0.010	227	0.004
30	0.094	30	0.035	189	0.044	189	0.029	284	0.021	303	0.012	379	0.005
38	0.104	76	0.052	227	0.048	284	0.035	379	0.024	379	0.013	946	0.007
76	0.145	151	0.071	265	0.051	379	0.040	568	0.029	757	0.018	1,893	0.010
114	0.185	189	0.079	379	0.064	568	0.051	833	0.037	1,363	0.025	3,028	0.014
151	0.226	227	0.088	568	0.092	757	0.068	1,514	0.069	1,893	0.034	3,785	0.018
227	0.343	265	0.099	757	0.125	1,893	0.201	2,271	0.111	2,650	0.050	7,571	0.040
		379	0.139	1,136	0.203	2,839	0.392	3,028	0.163	3,407	0.067	11,356	0.068
		946	0.443	1,514	0.311			3,785	0.234	5,678	0.133	15,142	0.108
								5,678	0.471	11,356	0.436	18,927	0.157
												22,712	0.218
												30,283	0.352

Figure 2-2: NFF 3x3 UL201 Non-Fluorinated Foam Concentrate Pressure Drop Vs Flow Rate - Schedule 40 Pipe (Metric)



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Note: Above figure is a graphical representation of the data in Table 2-2. Dashed lines represent the turbulent flow area. Johnson Controls recommends upsizing of pipe when system concentrate flow gets into this area. The data above is valid for pipe equivalent lengths up to 122 m. The data above is applicable across the UL Listed temperature range of the foam concentrate.

Note: While NFF (also known as SFFF) agents may be compatible with existing AFFF and/or NFF hardware, system contamination from fluorinated agents may exist if hardware and piping is not replaced upon conversion to non-fluorinated agents.

Safety Data Sheets (SDS) are available at www.chemguard.com

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