Tentative Interim Amendment

NFPA® 291

Recommended Practice for Fire Flow Testing and Marking of Hydrants

2019 Edition

Reference: Table 4.10.1(b)
TIA 19-2
(SC 19-4-5 / TIA Log #1412)

Pursuant to Section 5 of the NFPA *Regulations Governing the Development of NFPA Standards*, the National Fire Protection Association has issued the following Tentative Interim Amendment to NFPA 291, *Recommended Practice for Fire Flow Testing and Marking of Hydrants*, 2019 edition. The TIA was processed by the Technical Committee on Private Water Supply Piping Systems and the Correlating Committee on Automatic Sprinkler Systems, and was issued by the Standards Council on April 5, 2019, with an effective date of April 25, 2019.

A Tentative Interim Amendment is tentative because it has not been processed through the entire standards development procedures. It is interim because it is effective only between editions of the standard. A TIA automatically becomes a public input of the proponent for the next edition of the standard; as such, it then is subject to all of the procedures of the standards development process.

1. Delete the current Table 4.10.1(b) and replace with a new one as follows:

Table 4.10.1(b) Theoretical Discharge Through Circular Orifices (Liters of Water per Minute)

Pitot Pressure (kPa)	Pitot Pressure (bar)	Meters (m)	Velocity Discharge (m/sec)	Orifice Size (mm)											
				51	57	60	65	67	70	76	83	89	95	102	114
5	0.1	0.51	3.16	387	484	536	629	669	730	860	1026	1180	1344	1549	1935
10	0.1	1.02	4.47	548	684	758	890	945	1032	1216	1451	1668	1901	2191	2737
15	0.2	1.53	5.48	671	838	929	1090	1158	1264	1490	1777	2043	2328	2684	3352
20	0.2	2.04	6.33	775	968	1072	1258	1337	1459	1720	2052	2359	2688	3099	3871
25	0.3	2.55	7.07	866	1082	1199	1407	1495	1632	1923	2294	2638	3005	3465	4328
30	0.3	3.06	7.75	949	1185	1313	1541	1638	1787	2107	2513	2889	3292	3795	4741
35	0.4	3.57	8.37	1025	1280	1418	1665	1769	1931	2276	2714	3121	3556	4099	5121
40	0.4	4.08	8.95	1096	1369	1516	1780	1891	2064	2433	2902	3336	3801	4382	5474
45	0.5	4.59	9.49	1162	1452	1608	1888	2006	2189	2581	3078	3539	4032	4648	5806
50	0.5	5.1	10.00	1225	1530	1695	1990	2114	2308	2720	3244	3730	4250	4900	6120
55	0.6	5.61	10.49	1285	1605	1778	2087	2217	2420	2853	3403	3912	4458	5139	6419
60	0.6	6.12	10.96	1342	1676	1857	2180	2316	2528	2980	3554	4086	4656	5367	6704
65	0.7	6.63	11.41	1397	1745	1933	2269	2410	2631	3101	3699	4253	4846	5586	6978
70	0.7	7.14	11.84	1449	1810	2006	2354	2501	2730	3218	3839	4414	5029	5797	7242
75	0.8	7.65	12.25	1500	1874	2076	2437	2589	2826	3331	3973	4569	5205	6001	7496
80	0.8	8.16	12.65	1549	1935	2144	2517	2674	2919	3441	4104	4718	5376	6198	7742
85	0.9	8.67	13.04	1597	1995	2210	2594	2756	3009	3547	4230	4864	5542	6388	7980
90	0.9	9.18	13.42	1643	2053	2275	2669	2836	3096	3649	4353	5005	5702	6573	8211
95	1.0	9.69	13.79	1688	2109	2337	2743	2914	3181	3749	4472	5142	5858	6754	8436
100	1.0	10.2	14.15	1732	2164	2398	2814	2990	3263	3847	4588	5275	6011	6929	8655

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New revised Table 4.10.1(b):

Table 4.10.1 (b) Theoretical Discharge Through Circular Orifices (Liters of Water per Minute)

Pitot Pressure (kPa)	Pitot Pressure (bar)	Meters (m)	Orifice Size (mm)												
			44.5	50.8	57.2	60.3	63.5	66.7	69.9	76.2	82.6	88.9	95.3	101.6	114.3
5	0.05	0.51	295	384	487	541	600	663	728	865	1016	1177	1353	1537	1946
10	0.10	1.02	417	544	689	766	849	937	1029	1223	1437	1664	1913	2174	2751
15	0.15	1.53	511	666	844	938	1040	1148	1260	1498	1760	2039	2343	2663	3370
20	0.20	2.04	590	769	974	1083	1201	1325	1455	1729	2032	2354	2705	3075	3891
25	0.25	2.55	659	859	1090	1211	1343	1481	1627	1934	2272	2632	3024	3437	4350
30	0.30	3.06	722	941	1194	1326	1471	1623	1782	2118	2489	2883	3313	3765	4766
35	0.35	3.57	780	1017	1289	1433	1589	1753	1925	2288	2688	3114	3578	4067	5148
40	0.40	4.08	834	1087	1378	1532	1698	1874	2058	2446	2874	3329	3826	4348	5503
45	0.45	4.59	885	1153	1462	1624	1801	1988	2183	2594	3048	3531	4058	4612	5837
50	0.50	5.10	933	1215	1541	1712	1899	2095	2301	2734	3213	3722	4277	4861	6153
55	0.55	5.61	978	1275	1616	1796	1992	2197	2413	2868	3370	3904	4486	5099	6453
60	0.60	6.12	1022	1331	1688	1876	2080	2295	2521	2995	3520	4077	4685	5325	6740
65	0.65	6.63	1063	1386	1757	1952	2165	2389	2624	3118	3663	4244	4877	5543	7015
70	0.70	7.14	1103	1438	1823	2026	2247	2479	2723	3235	3802	4404	5061	5752	7280
75	0.75	7.65	1142	1488	1887	2097	2326	2566	2818	3349	3935	4558	5238	5954	7535
80	0.80	8.16	1180	1537	1949	2166	2402	2650	2911	3459	4064	4708	5410	6149	7782
85	0.85	8.67	1216	1585	2009	2233	2476	2732	3000	3565	4189	4853	5577	6338	8022
90	0.90	9.18	1251	1631	2067	2297	2548	2811	3087	3669	4311	4993	5738	6522	8254
95	0.95	9.69	1285	1675	2124	2360	2617	2888	3172	3769	4429	5130	5896	6701	8481
100	1.00	10.20	1319	1719	2179	2422	2685	2963	3254	3867	4544	5264	6049	6875	8701
105	1.05	10.71	1351	1761	2233	2481	2752	3036	3334	3963	4656	5394	6198	7045	8916
110	1.10	11.22	1383	1803	2285	2540	2817	3108	3413	4056	4766	5520	6344	7210	9126
115	1.15	11.73	1414	1843	2337	2597	2880	3177	3490	4147	4873	5645	6486	7372	9331
120	1.20	12.24	1445	1883	2387	2653	2942	3246	3565	4236	4978	5766	6626	7531	9531
125	1.25	12.75	1475	1922	2436	2707	3002	3313	3638	4324	5080	5885	6763	7686	9728
130	1.30	13.26	1504	1960	2484	2761	3062	3378	3710	4409	5181	6001	6897	7839	9921
140	1.40	14.28	1560	2034	2578	2865	3178	3506	3850	4576	5376	6228	7157	8134	10295
150	1.50	15.30	1615	2105	2669	2966	3289	3629	3985	4736	5565	6446	7408	8420	10656
160	1.60	16.32	1668	2174	2756	3063	3397	3748	4116	4892	5748	6658	7651	8696	11006
170	1.70	17.34	1720	2241	2841	3157	3501	3863	4243	5042	5925	6863	7887	8964	11345
180	1.80	18.36	1769	2306	2923	3249	3603	3975	4366	5188	6096	7062	8115	9224	11674
190	1.90	19.38	1818	2369	3004	3338	3702	4084	4485	5330	6263	7255	8338	9476	11993
200	2.00	20.40	1865	2431	3082	3425	3798	4190	4602	5469	6426	7444	8554	9722	12305
210	2.10	21.42	1911	2491	3158	3509	3892	4294	4716	5604	6585	7628	8765	9963	12609
220	2.20	22.44	1956	2549	3232	3592	3983	4395	4827	5736	6740	7807	8972	10197	12906
230	2.30	23.46	2000	2607	3305	3673	4073	4494	4935	5865	6891	7983	9173	10426	13196
240	2.40	24.48	2043	2663	3376	3752	4160	4590	5041	5991	7039	8154	9371	10650	13479
250	2.50	25.50	2085	2718	3445	3829	4246	4685	5145	6114	7185	8322	9564	10870	13757
260	2.60	26.52	2127	2771	3514	3905	4330	4778	5247	6235	7327	8487	9753	11085	14030
270	2.70	27.54	2167	2824	3581	3979	4413	4869	5347	6354	7466	8649	9939	11296	14297
285	2.85	29.07	2226	2902	3679	4088	4534	5002	5494	6528	7671	8886	10211	11606	14689
300	3.00	30.60	2284	2977	3774	4194	4651	5132	5636	6698	7870	9117	10477	11908	15070
315	3.15	32.13	2341	3050	3867	4298	4766	5259	5775	6863	8065	9342	10735	12202	15443
330	3.30	33.66	2396	3122	3958	4399	4878	5382	5911	7025	8255	9562	10988	12489	15806
345	3.45	35.19	2450	3192	4047	4498	4988	5503	6044	7183	8440	9777	11235	12769	16161
360	3.60	36.72	2502	3261	4134	4595	5095	5622	6174	7337	8622	9987	11477	13044	16509
375	3.75	38.25	2554	3328	4220	4689	5200	5738	6302	7489	8799	10193	11713	13313	16849
390	3.90	39.78	2605	3394	4303	4782	5303	5851	6426	7637	8974	10395	11945	13577	17183
405	4.05	41.31	2654	3459	4385	4873	5404	5963	6549	7782	9145	10593	12173	13835	17510
420	4.20	42.84	2703	3522	4466	4963	5504	6072	6669	7925	9312	10787	12396	14089	17832
435	4.35	44.37	2751	3585	4545	5051	5601	6180	6787	8065	9477	10978	12616	14339	18147
450	4.50	45.90	2798	3646	4622	5137	5697	6285	6903	8203	9639	11166	12831	14584	18458
465	4.65	47.43	2844	3706	4699	5222	5791	6389	7017	8339	9799	11350	13043	14825	18763
480	4.80	48.96	2889	3765	4774	5306	5884	6492	7129	8472	9955	11532	13252	15062	19063
495	4.95	50.49	2934	3824	4848	5388	5975	6592	7240	8604	10110	11711	13457	15296	19358
510	5.10	52.02	2978	3881	4921	5469	6065	6691	7349	8733	10262	11887	13660	15526	19650
525	5.25	53.55	3022	3938	4993	5549	6153	6789	7456	8861	10412	12060	13859	15752	19936
540	5.40	55.08	3065	3994	5064	5627	6240	6885	7562	8986	10559	12231	14056	15976	20219
555	5.55	56.61	3107	4049	5133	5705	6327	6980	7666	9110	10705	12400	14250	16196	20498
570	5.70	58.14	3149	4103	5202	5782	6411	7074	7769	9233	10849	12567	14441	16413	20773
585	5.85	59.67	3190	4157	5270	5857	6495	7166	7871	9353	10990	12731	14630	16628	21045
600	6.00	61.20	3231	4210	5338	5932	6578	7258	7971	9472	11130	12893	14816	16840	21313
615	6.15	62.73	3271	4262	5404	6005	6660	7348	8070	9590	11269	13053	15000	17049	21578
630	6.30	64.26	3310	4314	5469	6078	6740	7437	8168	9706	11405	13211	15182	17256	21839
645	6.45	65.79	3349	4365	5534	6150	6820	7525	8264	9821	11540	13368	15362	17460	22098
660	6.60	67.32	3388	4415	5598	6221	6899	7612	8360	9935	11674	13522	15539	17662	22353
675	6.75	68.85	3426	4465	5661	6292	6977	7698	8454	10047	11806	13675	15715	17861	22606
690	6.90	70.38	3464	4515	5724	6361	7054	7783	8548	10158	11936	13826	15889	18059	22856

705	7.05	71.91	3502	4563	5786	6430	7130	7867	8640	10268	12065	13976	16060	18254	23103
720	7.20	73.44	3539	4612	5847	6498	7206	7950	8732	10376	12193	14124	16230	18447	23347
735	7.35	74.97	3576	4660	5908	6565	7281	8033	8822	10484	12319	14270	16398	18638	23589
750	7.50	76.50	3612	4707	5968	6632	7354	8114	8912	10590	12444	14415	16565	18827	23829
765	7.65	78.03	3648	4754	6027	6698	7428	8195	9000	10696	12568	14558	16730	19015	24066
780	7.80	79.56	3683	4800	6086	6763	7500	8275	9088	10800	12691	14700	16893	19200	24300
795	7.95	81.09	3719	4846	6144	6828	7572	8354	9175	10904	12812	14841	17055	19384	24533
810	8.10	82.62	3754	4892	6202	6892	7643	8433	9261	11006	12932	14980	17215	19566	24763
825	8.25	84.15	3788	4937	6259	6956	7713	8510	9347	11107	13052	15118	17373	19746	24992
840	8.40	85.68	3822	4981	6315	7019	7783	8587	9431	11208	13170	15255	17531	19925	25218
855	8.55	87.21	3856	5026	6372	7081	7852	8664	9515	11308	13287	15391	17687	20102	25442
870	8.70	88.74	3890	5069	6427	7143	7921	8739	9598	11406	13403	15525	17841	20278	25664
885	8.85	90.27	3923	5113	6482	7204	7989	8814	9681	11504	13518	15658	17994	20452	25884
900	9.00	91.80	3957	5156	6537	7265	8056	8889	9762	11601	13632	15791	18146	20624	26103
915	9.15	93.33	3989	5199	6591	7325	8123	8963	9843	11698	13745	15922	18297	20796	26319
930	9.30	94.86	4022	5241	6645	7385	8190	9036	9924	11793	13857	16052	18446	20965	26534
945	9.45	96.39	4054	5283	6699	7444	8255	9108	10003	11888	13969	16181	18594	21134	26747

Notes:
(1) This table is computed from the formula $Q_M = 0.0666\ cd^2\sqrt{p_M}$, with $c = 1.00$. The theoretical discharge of seawater, as from fireboat nozzles, can be found by subtracting 1 percent from the figures in Table 4.10.2.1, or from the formula $Q_M = 0.065cd^2\sqrt{p_M}$.
(2) Appropriate coefficient should be applied where it is read from the hydrant outlet. Where more accurate results are required, a coefficient appropriate on the particular nozzle must be selected and applied to the figures of the table. The discharge from circular openings of sizes other than those in the table can readily be computed by applying the principle that quantity discharged under a given head varies as the square of the diameter of the opening.

Issue Date: April 5, 2019

Effective Date: April 25, 2019