Second Revision No. 10-NFPA 291-2020 [Section No. 1.1]

1.1* Scope.

The scope of this document is water flow testing and marking of hydrants.

A.1.1

The scope of this document does not include the flow testing or marking of dry fire hydrants.

Submitter Information Verification

Committee: AUT-PRI

Submittal Date: Mon Jun 22 13:10:58 EDT 2020

Committee Statement

Committee Statement: Adding the proponent's text to the Recommended Practice will create confusion between Dry Barrel hydrants and Dry Fire hydrants, however, this admonition has a place as annex material.The proposed definition is not needed.

Response Message: SR-10-NFPA 291-2020

Public Comment No. 32-NFPA 291-2020 [New Section after 1.1]

Second Revision No. 2-NFPA 291-2020 [Section No. 1.2]

1.2* Purpose.

~~The purpose of this document is to provide~~ This document provides recommended practices to test and determine the available water supply for fire protection systems and fire flow purposes and the marking of hydrants.

Submitter Information Verification

Committee: AUT-PRI

Submittal Date: Thu Jun 18 13:06:59 EDT 2020

Committee Statement

Committee Statement: Revised text of purpose has better structure and clarifies the purposes for determining the available water supply.

Response Message: SR-2-NFPA 291-2020

Public Comment No. 38-NFPA 291-2020 [Section No. 1.2]

Second Revision No. 12-NFPA 291-2020 [Section No. 2.4]

2.4 References for Extracts in Recommendations Sections.

NFPA 1, *Fire Code,* ~~2018~~ 2021 edition.

NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances,* ~~2019~~ 2022 edition.

NFPA 1141, *Standard for Fire Protection Infrastructure for Land Development in Wildland, Rural, and Suburban Areas,* 2017 edition.

Submitter Information Verification

Committee: AUT-PRI

Submittal Date: Tue Jun 23 22:44:31 EDT 2020

Committee Statement

Committee Statement: Updated references.

Response Message: SR-12-NFPA 291-2020

Second Revision No. 3-NFPA 291-2020 [Section No. 4.2]

4.2 Rating Pressure.

4.2.1

For the purpose of uniform marking of fire hydrants, the ratings should be based on the flow available at the hydrant at a residual pressure of 20 psi (1.4 bar). ~~for all hydrants having a static pressure in excess of 40 psi (2.7 bar).~~

~~4.2.2~~

~~Hydrants having a static pressure of less than 40 psi (2.7 bar) should be rated at the flow available at the hydrant at a residual pressure that is one-half of the static pressure.~~

4.2.2

It is generally recommended that a minimum residual pressure of 20 psi (1.4 bar) should be maintained at hydrants when delivering the fire flow. Fire department pumpers can be operated where hydrant pressures are less, but with difficulty.

4.2.3

A primary concern should be the ability to maintain sufficient residual pressure to prevent developing a negative pressure at any point in the street mains, which could result in the collapse of the mains or other water system components or back-siphonage of polluted water from some other interconnected source.

4.2.4

It should be noted that the use of residual pressures of less than 20 psi (1.4 bar) is not permitted by many state health departments.

Submitter Information Verification

Committee: AUT-PRI

Submittal Date: Thu Jun 18 13:30:21 EDT 2020

Committee Statement

Committee Statement: The technical committee agrees with the submitter with regard to common practice and standard of care requirements of most water utilities and companies. Most municipal water districts and AHJ's look at the water supply volume at 20 psi as the common benchmark.

Response Message: SR-3-NFPA 291-2020

Public Comment No. 34-NFPA 291-2020 [Section No. 4.2]

Second Revision No. 4-NFPA 291-2020 [Section No. 4.3.1]

4.3.1*

Tests should be ~~made~~ conducted during ~~a~~ periods of ~~high (~~ peak~~)~~ demand, based on knowledge of the water supply and engineering judgment~~, taking into account daily and seasonal fluctuations, not extreme conditions~~ .

A.4.3.1

It is not intended that tests only be conducted during periods of peak demand. Where the water distribution system is subject to variable seasonal demands such as drought, future demands on the water supply system due to growth and development of the region, irrigation demands, and so forth, tests should be conducted whenever possible. When using the results of water supply test data to determine the adequacy of the water supply for any purpose, relevant factors should be considered.

Submitter Information Verification

Committee: AUT-PRI

Submittal Date: Fri Jun 19 10:09:52 EDT 2020

Committee Statement

Committee Statement: The revision to the base recommended practice plus the addition of the related annex material will provide better flow test practices and guidance overall.

Response Message: SR-4-NFPA 291-2020

Public Comment No. 28-NFPA 291-2020 [Section No. 4.3.1]

Public Comment No. 33-NFPA 291-2020 [Section No. 4.3.1]

Second Revision No. 11-NFPA 291-2020 [Section No. 4.4]

4.4* Layout of Test~~.~~ and Procedure to Determine the Available Water Supply in a Water Main.

A.4.4

This procedure should be used to evaluate the available water supply at a given location for use in designing fire protection systems. The recommended procedures for determining the available flow of a hydrant and for the purpose of marking that hydrant are in Section 4.5 .

4.4.1

After the location where the test is to be run has been determined, a group of test hydrants in the vicinity is selected.

4.4.2

Once selected, due consideration should be given to potential interference with traffic flow patterns, damage to surroundings (e.g., roadways, sidewalks, landscapes, vehicles, and pedestrians), and potential flooding problems both local and remote from the test site.

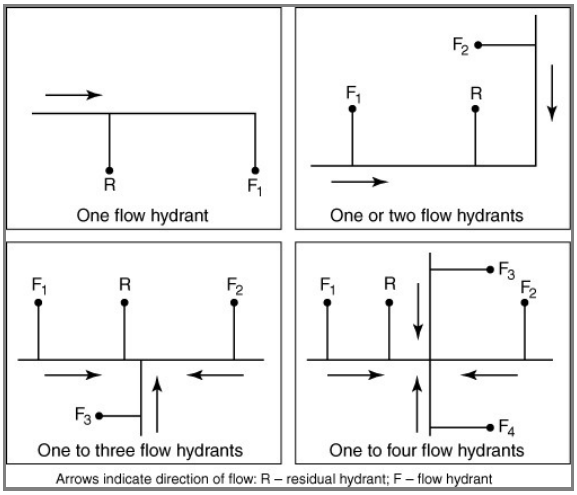
4.4.3

One hydrant, designated the residual hydrant, is chosen to be the hydrant where the normal static pressure will be observed with the other hydrants in the group closed, and where the residual pressure will be observed with the other hydrants flowing.

4.4.4

This hydrant is chosen so it will be located between the hydrant to be flowed and the large mains that constitute the immediate sources of water supply in the area. In Figure 4.4.4, test layouts are indicated showing the residual hydrant designated with the letter R and hydrants to be flowed with the letter F.

Figure 4.4.4 Suggested Test Layout for Hydrants.



4.4.5

The number of hydrants to be used in any test depends upon the strength of the distribution system in the vicinity of the test location.

4.4.6

To obtain satisfactory test results of theoretical calculation of expected flows or rated capacities, sufficient discharge should be achieved to cause a drop in pressure at the residual hydrant of at least 10 percent. ~~, or to flow the total demand necessary for fire protection purposes.~~ In water supply systems where additional municipal pumps increase the flow and pressure as additional test hydrants are opened, it might be necessary to declare an artificial drop in the static pressure of 10 percent to create a theoretical water supply curve.

4.4.7

When conducting a flow test for the purpose of fire protection system design, the flow and pressure results should be adequate for the total demand of the system.

4.4.8

If the mains are small and the system weak, only one or two hydrants need to be flowed.

4.4.9

If the mains are large and the system strong, it might be necessary to flow as many as seven or eight hydrants.

4.5* Layout of Test and Procedure to Evaluate the Available Flow Through a Fire Hydrant.

A.4.5

This procedure should be used to evaluate the available water flow at a given fire hydrant. The recommended procedures for determining the available water supply for the design of a fire sprinkler system or other fire protection are in Section 4.4 .

4.5.1

When the purpose of a flow test is to determine the available flow through an individual fire hydrant only, the static and residual pressures should be taken at a single hydrant. The flow hydrant is also used as the static/residual hydrant.

4.5.2

A pressure gauge (or other pressure measuring device) should be located on one of the 2 ½ in. (65 mm) hydrant outlets *[see 4.6.1(5)]* .

4.5.3

A closed control valve connected to a discharge nozzle(s) for the purpose of rate of flow measurement should be located on one of the other hydrant outlets.

4.5.4

The test procedures in Section 4.7 for venting air and taking static/residual readings and Section 4.8 for taking pitot readings should be followed.

4.5.5

The control valve on another hydrant outlet should be opened. When the rate of flow stabilizes, rate of flow and residual pressure measurements are taken and recorded.

Submitter Information Verification

Committee: AUT-PRI

Submittal Date: Tue Jun 23 21:29:32 EDT 2020

Committee Statement

Committee Statement: The existing recommended practice is best suited for determining the available water supply in the water main, but not necessarily for determining the water flow at an individual fire hydrant. Adding this new section will provide a single hydrant test option for the best practice to determine the water flow of that hydrant with more accuracy.

By definition, the term, “total system demand” includes any required hose allowance. Additional language provides guidance where many more hydrants might be required to achieve the desired flow test data.

Renumber subsequent sections.

Response Message: SR-11-NFPA 291-2020

Public Comment No. 24-NFPA 291-2020 [New Section after 4.3.3]

Public Comment No. 23-NFPA 291-2020 [New Section after 4.3.3]

Public Comment No. 21-NFPA 291-2020 [New Section after 4.3.3]

Public Comment No. 25-NFPA 291-2020 [New Section after 4.3.3]

Public Comment No. 8-NFPA 291-2020 [New Section after 4.4]

Public Comment No. 16-NFPA 291-2020 [Section No. 4.4]

Public Comment No. 29-NFPA 291-2020 [Section No. 4.4.6]

Public Comment No. 26-NFPA 291-2020 [Section No. 4.6]

Public Comment No. 40-NFPA 291-2020 [Section No. 4.4.6]

Public Comment No. 17-NFPA 291-2020 [New Section after 4.3.3]

Public Comment No. 18-NFPA 291-2020 [New Section after 4.4]

Public Comment No. 19-NFPA 291-2020 [New Section after 4.3.3]

Public Comment No. 20-NFPA 291-2020 [New Section after 4.3.3]

Second Revision No. 7-NFPA 291-2020 [Section No. 4.6.1]

4.7.1

In a typical test, the 100 psi (6.9 bar) or 200 psi (14 bar) gauge is attached to one of the 2½ in. (65 mm) outlets of the residual hydrant using the special cap.

Submitter Information Verification

Committee: AUT-PRI

Submittal Date: Fri Jun 19 12:31:25 EDT 2020

Committee Statement

Committee Statement: The technical committee agrees the current language conflicts with section 4.5.1 and this change will clear up the conflict.

Response Message: SR-7-NFPA 291-2020

Public Comment No. 35-NFPA 291-2020 [Section No. 4.6.1]

Second Revision No. 14-NFPA 291-2020 [Section No. 4.6.4]

4.6.4

When more than one hydrant is flowed, it is desirable and could be necessary to ~~to~~ facilitate communications between team members.

Submitter Information Verification

Committee: AUT-PRI

Submittal Date: Wed Jul 15 21:49:04 EDT 2020

Committee Statement

Committee Statement: Editorial Correction.

Response Message: SR-14-NFPA 291-2020

Second Revision No. 15-NFPA 291-2020 [Section No. 4.10.3]

4.10.3

These coefficients are applied in addition to the coefficient in Equations ~~4.8.3b~~ 4.9.3a and 4.8 9 .3b and are for average-type hydrants.

Submitter Information Verification

Committee: AUT-PRI
Submittal Date: Wed Jul 15 21:52:00 EDT 2020

Committee Statement

Committee Statement: Editorial correction.
Response Message: SR-15-NFPA 291-2020

Second Revision No. 8-NFPA 291-2020 [Section No. 4.11.1.2]

4.12.1.2

The formula that is generally used to compute the ~~discharge at the~~ available flow in the desired test location (either the underground main or static/residual hydrant, depending on the test), the specified residual pressure, or for any desired pressure drop is Equation 4.~~11~~ 12 .1.2:

$$Q_R = Q_F \times \frac{h_r^{0.54}}{h_f^{0.54}}$$ **[4.~~11~~ 12 .1.2]**

where:

Q_R = flow predicted at desired residual pressure

Q_F = total flow measured during test

h_r = pressure drop to desired residual pressure

h_f = pressure drop measured during test

Submitter Information Verification

Committee: AUT-PRI

Submittal Date: Fri Jun 19 12:33:13 EDT 2020

Committee Statement

Committee Statement: This change is needed in support of the technical committee action taken on SR #11 which differentiates between flow at the hydrant and flow in the water main.

Response Message: SR-8-NFPA 291-2020

Public Comment No. 27-NFPA 291-2020 [Section No. 4.11.1.2]

Second Revision No. 16-NFPA 291-2020 [Section No. 4.12.1 [Excluding any Sub-Sections]]

The discharge in gpm (L/min) for each outlet flowed is obtained from ~~Table 4.11.1(a)~~ Table 4.12.1(a) and ~~Table 4.11.1(b)~~ Table 4.12.1(b) or by the use of Equations 4.~~8~~ 9 .3a and 4.~~8~~ 9 .3b.

Table 4.12.1(a) Theoretical Discharge Through Circular Orifices (U.S. Gallons of Water per Minute)

Pitot Pressure (psi)	- Feet	-	-	Orifice Size (in.)												
			1.75	2	2.25	2.375	2.5	2.625	2.75	3	3.25	3.5	3.75	4	4.5
1	2.31		91	119	151	168	187	206	226	269	315	366	420	477	604
2	4.61		129	169	214	238	264	291	319	380	446	517	593	675	855
3	6.92		158	207	262	292	323	356	391	465	546	633	727	827	1047
4	9.23		183	239	302	337	373	411	451	537	630	731	839	955	1209
5	11.54		204	267	338	376	417	460	505	601	705	817	938	1068	1351
6	13.84		224	292	370	412	457	504	553	658	772	895	1028	1169	1480
7	16.15		242	316	400	445	493	544	597	711	834	967	1110	1263	1599
8	18.46		258	338	427	476	528	582	638	760	891	1034	1187	1350	1709
9	20.76		274	358	453	505	560	617	677	806	946	1097	1259	1432	1813
10	23.07		289	377	478	532	590	650	714	849	997	1156	1327	1510	1911
11	25.38		303	396	501	558	619	682	748	891	1045	1212	1392	1583	2004
12	27.68		317	413	523	583	646	712	782	930	1092	1266	1454	1654	2093
13	29.99		329	430	545	607	672	741	814	968	1136	1318	1513	1721	2179
14	32.30		342	447	565	630	698	769	844	1005	1179	1368	1570	1786	2261
15	34.61		354	462	585	652	722	796	874	1040	1221	1416	1625	1849	2340
16	36.91		366	477	604	673	746	822	903	1074	1261	1462	1679	1910	2417
17	39.22		377	492	623	694	769	848	930	1107	1300	1507	1730	1969	2491
18	41.53		388	506	641	714	791	872	957	1139	1337	1551	1780	2026	2564
19	43.83		398	520	658	734	813	896	984	1171	1374	1593	1829	2081	2634
20	46.14		409	534	676	753	834	920	1009	1201	1410	1635	1877	2135	2702
22	50.75		429	560	709	789	875	964	1058	1260	1478	1715	1968	2239	2834
24	55.37		448	585	740	825	914	1007	1106	1316	1544	1791	2056	2339	2960
26	59.98		466	609	770	858	951	1048	1151	1369	1607	1864	2140	2434	3081
28	64.60		484	632	799	891	987	1088	1194	1421	1668	1934	2220	2526	3197
30	69.21		501	654	827	922	1022	1126	1236	1471	1726	2002	2298	2615	3310
32	73.82		517	675	855	952	1055	1163	1277	1519	1783	2068	2374	2701	3418
34	78.44		533	696	881	981	1087	1199	1316	1566	1838	2131	2447	2784	3523
36	83.05		548	716	906	1010	1119	1234	1354	1611	1891	2193	2518	2865	3626
38	87.67		563	736	931	1038	1150	1268	1391	1656	1943	2253	2587	2943	3725
40	92.28		578	755	955	1065	1180	1300	1427	1699	1993	2312	2654	3020	3822
42	96.89		592	774	979	1091	1209	1333	1462	1740	2043	2369	2719	3094	3916
44	101.51		606	792	1002	1116	1237	1364	1497	1781	2091	2425	2783	3167	4008
46	106.12		620	810	1025	1142	1265	1395	1531	1821	2138	2479	2846	3238	4098
48	110.74		633	827	1047	1166	1292	1425	1563	1861	2184	2533	2907	3308	4186
50	115.35		646	844	1068	1190	1319	1454	1596	1899	2229	2585	2967	3376	4273
52	119.96		659	861	1089	1214	1345	1483	1627	1937	2273	2636	3026	3443	4357
54	124.58		672	877	1110	1237	1370	1511	1658	1974	2316	2686	3084	3508	4440
56	129.19		684	893	1130	1260	1396	1539	1689	2010	2359	2735	3140	3573	4522
58	133.81		696	909	1150	1282	1420	1566	1719	2045	2400	2784	3196	3636	4602
60	138.42		708	925	1170	1304	1445	1593	1748	2080	2441	2831	3250	3698	4681
62	143.03		720	940	1189	1325	1469	1619	1777	2115	2482	2878	3304	3759	4758
64	147.65		731	955	1209	1347	1492	1645	1805	2148	2521	2924	3357	3820	4834
66	152.26		742	970	1227	1367	1515	1670	1833	2182	2561	2970	3409	3879	4909

Pitot Pressure (psi)	- Feet	-	-	Orifice Size (in.)												
			1.75	2	2.25	2.375	2.5	2.625	2.75	3	3.25	3.5	3.75	4	4.5
68	156.88		754	984	1246	1388	1538	1696	1861	2215	2599	3014	3460	3937	4983
70	161.49		765	999	1264	1408	1560	1720	1888	2247	2637	3058	3511	3995	5056
72	166.10		775	1013	1282	1428	1583	1745	1915	2279	2674	3102	3561	4051	5127
74	170.72		786	1027	1300	1448	1604	1769	1941	2310	2711	3144	3610	4107	5198
76	175.33		797	1041	1317	1467	1626	1793	1967	2341	2748	3187	3658	4162	5268
78	179.95		807	1054	1334	1487	1647	1816	1993	2372	2784	3228	3706	4217	5337
80	184.56		817	1068	1351	1505	1668	1839	2018	2402	2819	3269	3753	4270	5405
82	189.17		828	1081	1368	1524	1689	1862	2043	2432	2854	3310	3800	4323	5472
84	193.79		838	1094	1385	1543	1709	1885	2068	2461	2889	3350	3846	4376	5538
86	198.40		847	1107	1401	1561	1730	1907	2093	2491	2923	3390	3891	4428	5604
88	203.02		857	1120	1417	1579	1750	1929	2117	2519	2957	3429	3936	4479	5668
90	207.63		867	1132	1433	1597	1769	1951	2141	2548	2990	3468	3981	4529	5733
92	212.24		877	1145	1449	1614	1789	1972	2165	2576	3023	3506	4025	4579	5796
94	216.86		886	1157	1465	1632	1808	1994	2188	2604	3056	3544	4068	4629	5859
96	221.47		895	1169	1480	1649	1827	2015	2211	2631	3088	3582	4111	4678	5921
98	226.09		905	1182	1495	1666	1846	2035	2234	2659	3120	3619	4154	4726	5982
100	230.70		914	1194	1511	1683	1865	2056	2257	2686	3152	3655	4196	4774	6043
102	235.31		923	1205	1526	1700	1884	2077	2279	2712	3183	3692	4238	4822	6103
104	239.93		932	1217	1541	1716	1902	2097	2301	2739	3214	3728	4279	4869	6162
106	244.54		941	1229	1555	1733	1920	2117	2323	2765	3245	3763	4320	4916	6221
108	249.16		950	1240	1570	1749	1938	2137	2345	2791	3275	3799	4361	4962	6280
110	253.77		958	1252	1584	1765	1956	2157	2367	2817	3306	3834	4401	5007	6338
112	258.38		967	1263	1599	1781	1974	2176	2388	2842	3336	3869	4441	5053	6395
114	263.00		976	1274	1613	1797	1991	2195	2409	2867	3365	3903	4480	5098	6452
116	267.61		984	1286	1627	1813	2009	2215	2430	2892	3395	3937	4519	5142	6508
118	272.23		993	1297	1641	1828	2026	2234	2451	2917	3424	3971	4558	5186	6564
120	276.84		1001	1308	1655	1844	2043	2252	2472	2942	3453	4004	4597	5230	6619
122	281.45		1009	1318	1669	1859	2060	2271	2493	2966	3481	4038	4635	5273	6674
124	286.07		1018	1329	1682	1874	2077	2290	2513	2991	3510	4070	4673	5317	6729
126	290.68		1026	1340	1696	1889	2093	2308	2533	3015	3538	4103	4710	5359	6783
128	295.30		1034	1350	1709	1904	2110	2326	2553	3038	3566	4136	4748	5402	6836
130	299.91		1042	1361	1722	1919	2126	2344	2573	3062	3594	4168	4784	5444	6890
132	304.52		1050	1371	1736	1934	2143	2362	2593	3086	3621	4200	4821	5485	6942
134	309.14		1058	1382	1749	1948	2159	2380	2612	3109	3649	4231	4858	5527	6995
136	313.75		1066	1392	1762	1963	2175	2398	2632	3132	3676	4263	4894	5568	7047

Notes:

(1) This table is computed from the formula $Q = 29.84cd^2\sqrt{p}$, 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 4.11.2.1, or from~~ using the formula $Q = 29.84cd^2\sqrt{p}$.

(2) Appropriate coefficient should be applied where it is read from 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.

Table 4.12.1(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	11
5	0.05	0.51	295	384	487	541	600	663	728	865	1016	1177	1353	1537	194
10	0.10	1.02	417	544	689	766	849	937	1029	1223	1437	1664	1913	2174	275
15	0.15	1.53	511	666	844	938	1040	1148	1260	1498	1760	2039	2343	2663	337
20	0.20	2.04	590	769	974	1083	1201	1325	1455	1729	2032	2354	2705	3075	389
25	0.25	2.55	659	859	1090	1211	1343	1481	1627	1934	2272	2632	3024	3437	435
30	0.30	3.06	722	941	1194	1326	1471	1623	1782	2118	2489	2883	3313	3765	476
35	0.35	3.57	780	1017	1289	1433	1589	1753	1925	2288	2688	3114	3578	4067	514
40	0.40	4.08	834	1087	1378	1532	1698	1874	2058	2446	2874	3329	3826	4348	550
45	0.45	4.59	885	1153	1462	1624	1801	1988	2183	2594	3048	3531	4058	4612	583
50	0.50	5.10	933	1215	1541	1712	1899	2095	2301	2734	3213	3722	4277	4861	615
55	0.55	5.61	978	1275	1616	1796	1992	2197	2413	2868	3370	3904	4486	5099	645
60	0.60	6.12	1022	1331	1688	1876	2080	2295	2521	2995	3520	4077	4685	5325	674
65	0.65	6.63	1063	1386	1757	1952	2165	2389	2624	3118	3663	4244	4877	5543	701
70	0.70	7.14	1103	1438	1823	2026	2247	2479	2723	3235	3802	4404	5061	5752	728
75	0.75	7.65	1142	1488	1887	2097	2326	2566	2818	3349	3935	4558	5238	5954	753
80	0.80	8.16	1180	1537	1949	2166	2402	2650	2911	3459	4064	4708	5410	6149	778
85	0.85	8.67	1216	1585	2009	2233	2476	2732	3000	3565	4189	4853	5577	6338	802
90	0.90	9.18	1251	1631	2067	2297	2548	2811	3087	3669	4311	4993	5738	6522	825
95	0.95	9.69	1285	1675	2124	2360	2617	2888	3172	3769	4429	5130	5896	6701	848
100	1.00	10.20	1319	1719	2179	2422	2685	2963	3254	3867	4544	5264	6049	6875	870
105	1.05	10.71	1351	1761	2233	2481	2752	3036	3334	3963	4656	5394	6198	7045	891
110	1.10	11.22	1383	1803	2285	2540	2817	3108	3413	4056	4766	5520	6344	7210	912
115	1.15	11.73	1414	1843	2337	2597	2880	3177	3490	4147	4873	5645	6486	7372	933
120	1.20	12.24	1445	1883	2387	2653	2942	3246	3565	4236	4978	5766	6626	7531	953
125	1.25	12.75	1475	1922	2436	2707	3002	3313	3638	4324	5080	5885	6763	7686	972
130	1.30	13.26	1504	1960	2484	2761	3062	3378	3710	4409	5181	6001	6897	7839	992
140	1.40	14.28	1560	2034	2578	2865	3178	3506	3850	4576	5376	6228	7157	8134	102
150	1.50	15.30	1615	2105	2669	2966	3289	3629	3985	4736	5565	6446	7408	8420	106
160	1.60	16.32	1668	2174	2756	3063	3397	3748	4116	4892	5748	6658	7651	8696	110
170	1.70	17.34	1720	2241	2841	3157	3501	3863	4243	5042	5925	6863	7887	8964	113
180	1.80	18.36	1769	2306	2923	3249	3603	3975	4366	5188	6096	7062	8115	9224	116
190	1.90	19.38	1818	2369	3004	3338	3702	4084	4485	5330	6263	7255	8338	9476	119
200	2.00	20.40	1865	2431	3082	3425	3798	4190	4602	5469	6426	7444	8554	9722	123
210	2.10	21.42	1911	2491	3158	3509	3892	4294	4716	5604	6585	7628	8765	9963	126
220	2.20	22.44	1956	2549	3232	3592	3983	4395	4827	5736	6740	7807	8972	10197	129
230	2.30	23.46	2000	2607	3305	3673	4073	4494	4935	5865	6891	7983	9173	10426	131
240	2.40	24.48	2043	2663	3376	3752	4160	4590	5041	5991	7039	8154	9371	10650	134
250	2.50	25.50	2085	2718	3445	3829	4246	4685	5145	6114	7185	8322	9564	10870	137
260	2.60	26.52	2127	2771	3514	3905	4330	4778	5247	6235	7327	8487	9753	11085	140
270	2.70	27.54	2167	2824	3581	3979	4413	4869	5347	6354	7466	8649	9939	11296	142
285	2.85	29.07	2226	2902	3679	4088	4534	5002	5494	6528	7671	8886	10211	11606	146
300	3.00	30.60	2284	2977	3774	4194	4651	5132	5636	6698	7870	9117	10477	11908	150
315	3.15	32.13	2341	3050	3867	4298	4766	5259	5775	6863	8065	9342	10735	12202	154
330	3.30	33.66	2396	3122	3958	4399	4878	5382	5911	7025	8255	9562	10988	12489	158
345	3.45	35.19	2450	3192	4047	4498	4988	5503	6044	7183	8440	9777	11235	12769	161
360	3.60	36.72	2502	3261	4134	4595	5095	5622	6174	7337	8622	9987	11477	13044	165

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	11
375	3.75	38.25	2554	3328	4220	4689	5200	5738	6302	7489	8799	10193	11713	13313	168
390	3.90	39.78	2605	3394	4303	4782	5303	5851	6426	7637	8974	10395	11945	13577	171
405	4.05	41.31	2654	3459	4385	4873	5404	5963	6549	7782	9145	10593	12173	13835	175
420	4.20	42.84	2703	3522	4466	4963	5504	6072	6669	7925	9312	10787	12396	14089	178
435	4.35	44.37	2751	3585	4545	5051	5601	6180	6787	8065	9477	10978	12616	14339	181
450	4.50	45.90	2798	3646	4622	5137	5697	6285	6903	8203	9639	11166	12831	14584	184
465	4.65	47.43	2844	3706	4699	5222	5791	6389	7017	8339	9799	11350	13043	14825	187
480	4.80	48.96	2889	3765	4774	5306	5884	6492	7129	8472	9955	11532	13252	15062	190
495	4.95	50.49	2934	3824	4848	5388	5975	6592	7240	8604	10110	11711	13457	15296	193
510	5.10	52.02	2978	3881	4921	5469	6065	6691	7349	8733	10262	11887	13660	15526	196
525	5.25	53.55	3022	3938	4993	5549	6153	6789	7456	8861	10412	12060	13859	15752	199
540	5.40	55.08	3065	3994	5064	5627	6240	6885	7562	8986	10559	12231	14056	15976	202
555	5.55	56.61	3107	4049	5133	5705	6327	6980	7666	9110	10705	12400	14250	16196	204
570	5.70	58.14	3149	4103	5202	5782	6411	7074	7769	9233	10849	12567	14441	16413	207
585	5.85	59.67	3190	4157	5270	5857	6495	7166	7871	9353	10990	12731	14630	16628	210
600	6.00	61.20	3231	4210	5338	5932	6578	7258	7971	9472	11130	12893	14816	16840	213
615	6.15	62.73	3271	4262	5404	6005	6660	7348	8070	9590	11269	13053	15000	17049	215
630	6.30	64.26	3310	4314	5469	6078	6740	7437	8168	9706	11405	13211	15182	17256	218
645	6.45	65.79	3349	4365	5534	6150	6820	7525	8264	9821	11540	13368	15362	17460	220
660	6.60	67.32	3388	4415	5598	6221	6899	7612	8360	9935	11674	13522	15539	17662	223
675	6.75	68.85	3426	4465	5661	6292	6977	7698	8454	10047	11806	13675	15715	17861	226
690	6.90	70.38	3464	4515	5724	6361	7054	7783	8548	10158	11936	13826	15889	18059	228
705	7.05	71.91	3502	4563	5786	6430	7130	7867	8640	10268	12065	13976	16060	18254	231
720	7.20	73.44	3539	4612	5847	6498	7206	7950	8732	10376	12193	14124	16230	18447	233
735	7.35	74.97	3576	4660	5908	6565	7281	8033	8822	10484	12319	14270	16398	18638	235
750	7.50	76.50	3612	4707	5968	6632	7354	8114	8912	10590	12444	14415	16565	18827	238
765	7.65	78.03	3648	4754	6027	6698	7428	8195	9000	10696	12568	14558	16730	19015	240
780	7.80	79.56	3683	4800	6086	6763	7500	8275	9088	10800	12691	14700	16893	19200	243
795	7.95	81.09	3719	4846	6144	6828	7572	8354	9175	10904	12812	14841	17055	19384	245
810	8.10	82.62	3754	4892	6202	6892	7643	8433	9261	11006	12932	14980	17215	19566	247
825	8.25	84.15	3788	4937	6259	6956	7713	8510	9347	11107	13052	15118	17373	19746	249
840	8.40	85.68	3822	4981	6315	7019	7783	8587	9431	11208	13170	15255	17531	19925	252
855	8.55	87.21	3856	5026	6372	7081	7852	8664	9515	11308	13287	15391	17687	20102	254
870	8.70	88.74	3890	5069	6427	7143	7921	8739	9598	11406	13403	15525	17841	20278	256
885	8.85	90.27	3923	5113	6482	7204	7989	8814	9681	11504	13518	15658	17994	20452	258
900	9.00	91.80	3957	5156	6537	7265	8056	8889	9762	11601	13632	15791	18146	20624	261
915	9.15	93.33	3989	5199	6591	7325	8123	8963	9843	11698	13745	15922	18297	20796	263
930	9.30	94.86	4022	5241	6645	7385	8190	9036	9924	11793	13857	16052	18446	20965	265
945	9.45	96.39	4054	5283	6699	7444	8255	9108	10003	11888	13969	16181	18594	21134	267

Notes:

(1) This table is computed from the formula $Q_M = 0.0666cd^2\sqrt{p_M}$, 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~~ using 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.

Submitter Information Verification

Committee: AUT-PRI

Submittal Date: Wed Jul 15 22:12:00 EDT 2020

Committee Statement

Committee Statement: The reference in note 1 of Table (a) and (b) has been deleted as the referenced table was deleted in the First Draft.

Response Message: SR-16-NFPA 291-2020

Second Revision No. 9-NFPA 291-2020 [Section No. 4.14.1]

4.15.1*

Public fire hydrants should be flow tested at least every 5 years to verify capacity and marking of the hydrant.

Submitter Information Verification

Committee: AUT-PRI

Submittal Date: Fri Jun 19 12:35:21 EDT 2020

Committee Statement

Committee Statement: Added text clarifies the intent to test hydrants at least every 5 years as opposed to the implied 5-year interval. There are many cases where it would be prudent to test hydrants more frequently.

Response Message: SR-9-NFPA 291-2020

Public Comment No. 30-NFPA 291-2020 [Section No. 4.14.1]