

Provided Data		
P ₁	400	kPa
L ₁	6.5	m
L ₂	0.3	m
L ₃	8.3	m
D ₁	0.0409	m
D ₂	0.0266	m
D ₃	0.0266	m
K _{valve}	8	fT
K _{elbow}	30	fT
K _{tee_turn}	60	fT
K _{tee_straight}	20	fT
K _{sprinkler}	50	
K _{reduction}	0.08	
e	0.000046	m
gamma	9.79	kN/m ³
nu	1.02E-06	m ² /s
z ₂	0.3	m
z ₃	0.3	m
8/g*pi ² *d ₁ ⁴	29527.59	
8/g*pi ² *d ₂ ⁴	165042.1	
8/g*pi ² *d ₃ ⁴	165042.1	

Iteration	Assumed Values				Q ₂ Calculated			Q ₃ Calculated			Q ₁ calc (m ³ /s)	Reynolds Number Calculated			Friction Factor Calculated			%diff			
	Q ₁ (m ³ /s)	f ₁	f ₂	f ₃	Q ₂ num	Q ₂ den	Q ₂ (m ³ /s)	Q ₃ num	Q ₃ den	Q ₃ (m ³ /s)		Re ₁	Re ₂	Re ₃	f ₁ calc	f ₂ calc	f ₃ calc	Q ₁	f ₁	f ₂	f ₃
1	0.010000	0.020000	0.020000	0.020000	29.874	8454374	0.00188	29.755	9546133.166	0.001765506	0.003645266	1.13E+04	5.43E+10	2.60E+17	0.03193	0.02254	0.02254	174.3284%	-37.3599%	-11.2715%	-11.2715%
2	0.003645	0.031928	0.022541	0.022541	38.108	8459103	0.00212	38.609	9801156.53	0.001984741	0.004107221	1.28E+04	6.11E+10	2.92E+17	0.03109	0.02254	0.02254	-11.2474%	2.6862%	0.0000%	0.0000%
3	0.004107	0.031093	0.022541	0.022541	37.542	8459103	0.00211	38.161	9652350.232	0.001988354	0.004095013	1.27E+04	6.09E+10	2.92E+17	0.03111	0.02254	0.02254	0.2981%	-0.0650%	0.0000%	0.0000%
4	0.004095	0.031113	0.022541	0.022541	37.557	8459103	0.00211	38.173	9763954.956	0.001977278	0.004084375	1.27E+04	6.08E+10	2.91E+17	0.03113	0.02254	0.02254	0.2604%	-0.0568%	0.0000%	0.0000%
5	0.004084	0.031131	0.022541	0.022541	37.571	8459103	0.00211	38.184	9577947.253	0.001996666	0.004104144	1.28E+04	6.11E+10	2.92E+17	0.03110	0.02254	0.02254	-0.4817%	0.1056%	0.0000%	0.0000%
6	0.004104	0.031098	0.022541	0.022541	37.546	8459103	0.00211	38.164	9614367.424	0.00199236	0.004099128	1.28E+04	6.10E+10	2.92E+17	0.03111	0.02254	0.02254	0.1224%	-0.0267%	0.0000%	0.0000%
7	0.004099	0.031107	0.022541	0.022541	37.552	8459103	0.00211	38.169	9577947.086	0.001996277	0.004103226	1.28E+04	6.11E+10	2.92E+17	0.03110	0.02254	0.02254	-0.0999%	0.0218%	0.0000%	0.0000%
8	0.004103	0.031100	0.022541	0.022541	37.547	8459103	0.00211	38.165	9579063.129	0.001996052	0.004102854	1.28E+04	6.11E+10	2.92E+17	0.03110	0.02254	0.02254	0.0091%	-0.0020%	0.0000%	0.0000%
9	0.004103	0.031100	0.022541	0.022541	37.547	8459103	0.00211	38.166	9579063.129	0.001996062	0.004102877	1.28E+04	6.11E+10	2.92E+17	0.03110	0.02254	0.02254	-0.0006%	0.0001%	0.0000%	0.0000%
10	0.004103	0.031100	0.022541	0.022541	37.547	8459103	0.00211	38.165	119425231.6	0.000565311	0.002672125	8.31E+03	3.98E+10	1.90E+17	0.03436	0.02254	0.02254	53.5436%	-9.4762%	0.0000%	0.0000%
11	0.002672	0.034356	0.022541	0.022541	39.125	8459103	0.00215	39.415	623560472.8	0.000251415	0.002402045	7.47E+03	3.57E+10	1.71E+17	0.03528	0.02254	0.02254	11.2437%	-2.6213%	0.0000%	0.0000%
12	0.002402	0.035281	0.022541	0.022541	39.364	8459103	0.00216	39.605	623560472.8	0.00025202	0.002409216	7.50E+03	3.59E+10	1.72E+17	0.03525	0.02254	0.02254	-0.2976%	0.0753%	0.0000%	0.0000%
13	0.002409	0.035254	0.022541	0.022541	39.358	8459103	0.00216	39.600	9577947.082	0.002033346	0.004190375	1.30E+04	6.24E+10	2.98E+17	0.03096	0.02254	0.02254	-42.5060%	13.8783%	0.0000%	0.0000%
14	0.004190	0.030958	0.022541	0.022541	37.434	8459103	0.00210	38.076	9577947.082	0.00199384	0.004097481	1.27E+04	6.10E+10	2.92E+17	0.03111	0.02254	0.02254	2.2671%	-0.4869%	0.0000%	0.0000%
15	0.004097	0.031109	0.022541	0.022541	37.554	8459103	0.00211	38.171	9577947.082	0.00199632	0.004103328	1.28E+04	6.11E+10	2.92E+17	0.03110	0.02254	0.02254	-0.1425%	0.0311%	0.0000%	0.0000%
16	0.004103	0.031100	0.022541	0.022541	37.547	8459103	0.00211	38.165	9577947.082	0.001996166	0.004102964	1.28E+04	6.11E+10	2.92E+17	0.03110	0.02254	0.02254	0.0089%	-0.0019%	0.0000%	0.0000%
17	0.004103	0.031100	0.022541	0.022541	37.547	8459103	0.00211	38.165	9577947.082	0.001996175	0.004102986	1.28E+04	6.11E+10	2.92E+17	0.03110	0.02254	0.02254	-0.0006%	0.0001%	0.0000%	0.0000%
18	0.004103	0.031100	0.022541	0.022541	37.547	8459103	0.00211	38.165	9577947.082	0.001996175	0.004102985	1.28E+04	6.11E+10	2.92E+17	0.03110	0.02254	0.02254	0.0000%	0.0000%	0.0000%	0.0000%

Provided Data		
e	0.000046	m
gamma	9.79	kN/m3
nu	1.02E-06	m2/s
Kelbow	30	fT
Ktee_turn	60	fT
Ktee_straight	20	fT
Kreduction	0.05	
D ₁	0.0525	m
D _{b1}	0.0409	m
D _{b2}	0.0409	m
L ₁	182.88	m
L _{b1}	274.32	m
L _{b2}	274.32	m
delta p	182.22	kPa

	Assumed Values				Reynolds Number Calculations			Q _{b1} calulations			Q _{b2} calulations				Friction Factor Calculations			% differences			
Iteration	Q ₁	f ₁	fb ₁	fb ₂	Re ₁	Re _{b1}	Re _{b2}	Q _{b1} num	Q _{b1} Den	Q _{b1}	Q _{b2} num	Q _{b2} Den	Q _{b2}	Q ₁ calc	f ₁ calc	fb ₁ calc	fb ₂ calc	Q ₁	f1	fb ₁	fb ₂
1	0.0000005	0.04	0.04	0.04	11.88832	1220806	1220806	18.61287	7921769	0.001533	18.61287	7921773.498	0.001533	0.003066	0.040319676	0.044107	0.044107	#####	0.80%	10.27%	10.27%
2	0.0030657	0.04032	0.044107	0.044107	72891.38	1346152	1346152	4.003627	8735135	0.000677	5.06242	8735139.04	0.000761	0.001438	0.04034785	0.044107	0.044107	-53.08%	0.07%	0.00%	0.00%
3	0.0014383	0.040348	0.044107	0.044107	34197.59	1346152	1346152	17.87146	8735135	0.00143	16.25754	8735139.061	0.001364	0.002795	0.040347839	0.044107	0.044107	94.30%	0.00%	0.00%	0.00%
4	0.0027946	0.040348	0.044107	0.044107	66446.34	1346152	1346152	9.095178	8735135	0.00102	7.481265	8735139.061	0.000925	0.001946	0.040347849	0.044107	0.044107	-30.37%	0.00%	0.00%	0.00%
5	0.0019459	0.040348	0.044107	0.044107	46265.79	1346152	1346152	15.24572	8735135	0.001321	13.63181	8735139.061	0.001249	0.00257	0.040347844	0.044107	0.044107	32.09%	0.00%	0.00%	0.00%
6	0.0025703	0.040348	0.044107	0.044107	61114.04	1346152	1346152	10.93442	8735135	0.001119	9.32051	8735139.061	0.001033	0.002152	0.040347848	0.044107	0.044107	-16.28%	0.00%	0.00%	0.00%
7	0.0021518	0.040348	0.044107	0.044107	51162.38	1346152	1346152	13.95573	8735135	0.001264	12.34181	8735139.061	0.001189	0.002453	0.040347845	0.044107	0.044107	13.98%	0.00%	0.00%	0.00%
8	0.0024526	0.040348	0.044107	0.044107	58315.44	1346152	1346152	11.8382	8735135	0.001164	10.22429	8735139.061	0.001082	0.002246	0.040347847	0.044107	0.044107	-8.42%	0.00%	0.00%	0.00%
9	0.002246	0.040348	0.044107	0.044107	53403.16	1346152	1346152	13.32215	8735135	0.001235	11.70824	8735139.061	0.001158	0.002393	0.040347846	0.044107	0.044107	6.53%	0.00%	0.00%	0.00%
10	0.0023927	0.040348	0.044107	0.044107	56890.34	1346152	1346152	12.28215	8735135	0.001186	10.66824	8735139.061	0.001105	0.002291	0.040347847	0.044107	0.044107	-4.25%	0.00%	0.00%	0.00%
11	0.0022909	0.040348	0.044107	0.044107	54469.93	1346152	1346152	13.01098	8735135	0.00122	11.39707	8735139.061	0.001142	0.002363	0.040347846	0.044107	0.044107	3.13%	0.00%	0.00%	0.00%
12	0.0023627	0.040348	0.044107	0.044107	56177.14	1346152	1346152	12.5002	8735135	0.001196	10.88629	8735139.061	0.001116	0.002313	0.040347847	0.044107	0.044107	-2.12%	0.00%	0.00%	0.00%
13	0.0023126	0.040348	0.044107	0.044107	54986.27	1346152	1346152	12.85816	8735135	0.001213	11.24425	8735139.061	0.001135	0.002348	0.040347846	0.044107	0.044107	1.52%	0.00%	0.00%	0.00%
14	0.0023478	0.040348	0.044107	0.044107	55823.52	1346152	1346152	12.6073	8735135	0.001201	10.99338	8735139.061	0.001122	0.002323	0.040347847	0.044107	0.044107	-1.05%	0.00%	0.00%	0.00%
15	0.0023232	0.040348	0.044107	0.044107	55238.1	1346152	1346152	12.7831	8735135	0.00121	11.16919	8735139.061	0.001131	0.00234	0.040347847	0.044107	0.044107	0.74%	0.00%	0.00%	0.00%
16	0.0023405	0.040348	0.044107	0.044107	55649.01	1346152	1346152	12.6599	8735135	0.001204	11.04598	8735139.061	0.001125	0.002328	0.040347847	0.044107	0.044107	-0.52%	0.00%	0.00%	0.00%
17	0.0023284	0.040348	0.044107	0.044107	55361.36	1346152	1346152	12.74624	8735135	0.001208	11.13233	8735139.061	0.001129	0.002337	0.040347847	0.044107	0.044107	0.36%	0.00%	0.00%	0.00%
18	0.0023369	0.040348	0.044107	0.044107	55563.11	1346152	1346152	12.68573	8735135	0.001205	11.07182	8735139.061	0.001126	0.002331	0.040347847	0.044107	0.044107	-0.25%	0.00%	0.00%	0.00%
19	0.0023309	0.040348	0.044107	0.044107	55421.8	1346152	1346152	12.72814	8735135	0.001207	11.11422	8735139.061	0.001128	0.002335	0.040347847	0.044107	0.044107	0.18%	0.00%	0.00%	0.00%
20	0.0023351	0.040348	0.044107	0.044107	55520.87	1346152	1346152	12.69842	8735135	0.001206	11.0845	8735139.061	0.001126	0.002332	0.040347847	0.044107	0.044107	-0.13%	0.00%	0.00%	0.00%
21	0.0023322	0.040348	0.044107	0.044107	55451.46	1346152	1346152	12.71925	8735135	0.001207	11.10533	8735139.061	0.001128	0.002334	0.040347847	0.044107	0.044107	0.09%	0.00%	0.00%	0.00%
22	0.0023342	0.040348	0.044107	0.044107	55500.11	1346152	1346152	12.70465	8735135	0.001206	11.09073	8735139.061	0.001127	0.002333	0.040347847	0.044107	0.044107	-0.06%	0.00%	0.00%	0.00%
23	0.0023328	0.040348	0.044107	0.044107	55466.02	1346152	1346152	12.71488	8735135	0.001206	11.10096	8735139.061	0.001127	0.002334	0.040347847	0.044107	0.044107	0.04%	0.00%	0.00%	0.00%
24	0.0023338	0.040348	0.044107	0.044107	55489.91	1346152	1346152	12.70771	8735135	0.001206	11.0938	8735139.061	0.001127	0.002333	0.040347847	0.044107	0.044107	-0.03%	0.00%	0.00%	0.00%
25	0.0023331	0.040348	0.044107	0.044107	55473.17	1346152	1346152	12.71273	8735135	0.001206	11.09882	8735139.061	0.001127	0.002334	0.040347847	0.044107	0.044107	0.02%	0.00%	0.00%	0.00%
26	0.0023336	0.040348	0.044107	0.044107	55484.9	1346152	1346152	12.70921	8735135	0.001206	11.0953	8735139.061	0.001127	0.002333	0.040347847	0.044107	0.044107	-0.01%	0.00%	0.00%	0.00%
27	0.0023332	0.040348	0.044107	0.044107	55476.68	1346152	1346152	12.71168	8735135	0.001206	11.09777	8735139.061	0.001127	0.002333	0.040347847	0.044107	0.044107	0.01%	0.00%	0.00%	0.00%
28	0.0023335	0.040348	0.044107	0.044107	55482.44	1346152	1346152	12.70995	8735135	0.001206	11.09604	8735139.061	0.001127	0.002333	0.040347847	0.044107	0.044107	-0.01%	0.00%	0.00%	0.00%
29	0.0023333	0.040348	0.044107	0.044107	55478.4	1346152	1346152	12.71116	8735135	0.001206	11.09725	8735139.061	0.001127	0.002333	0.040347847	0.044107	0.044107	0.01%	0.00%	0.00%	0.00%
30	0.0023334	0.040348	0.044107	0.044107	55481.23	1346152	1346152	12.71031	8735135	0.001206	11.0964	8735139.061	0.001127	0.002333	0.040347847	0.044107	0.044107	0.00%	0.00%	0.00%	0.00%