Branched Water Distribution Network

Introduction

A branched water distribution network of the industrial park for all zones is computed in this report.

Assumptions:

1. Water demand of each facility is taken from previously determined peak water demand for the design period of 30 years.
2. Overhead Tank pressure (head) is considered to be 40 psi.
3. Minimum pressure at distribution end is maintained at least 30 psi and maximum is maintained below 100 psi.
4. Velocity in the pipe is assumed to be 3 fps for initial pipe diameter calculation.
5. Friction factor is assumed to be 0.01.

Methodology:

1. A layout of water distribution pipe is prepared for each zone.
2. Each discharge point or facilities consuming water and intersections are provided with a node number.
3. Peak flows at different facilities are laid out from earlier reports.
   Note: For the industrial zone, production water demand is approximately distributed into relevant facilities.
4. Water demand at each node is determined by summing peak demands at following nodes.
5. An initial pipe diameter is then calculated from the formula:
$$Q = A \times v; A = \frac{\pi d^2}{4}$$
6. Each path of pipe network is isolated and pressure loss at the furthest point from Overhead Tank is computed and checked:
$$\text{Head loss (ft)}, h_f = 4f\frac{L}{D}\frac{v^2}{2g}$$
$$\text{Pressure loss (psi)} = h_f \times \frac{62.4}{144}$$
7. Diameter is reduced/increased on a trial & error basis until adequate pressure is met at all nodes.

Sample Calculation

Pipe diameter for Node 20, 21 of Zone 1:

- Water demand at node 21: $7.1 + 24.3 = 31.4$ klpd
- Water demand of d/s nodes: 40.1 klpd
- Cumulative demand: $31.4 + 40.1 = 71.5$ klpd $= 0.0292\ ft^3$/s
- Length: 117.5 ft
- Pipe area: $\frac{Q}{v} = \frac{0.0292}{3} \times 144 = 1.4\ in^2$
- Pipe diameter: $1.4 = \frac{\pi D^2}{4} or, D = 1.34$ in
- Provided pipe diameter: 1.5 in

Pressure check for path P02 of Zone 1:

Pressure loss for node 5, 6,

- Length: 167.5 ft
- Diameter: 1.5 in
- Head loss: $4 \times 0.01 \times \frac{167.5}{1.5/12} \frac{3^2}{2 \times 32.19} = 7.49$ ft
- Pressure loss: $7.49 \times \frac{62.4}{144} = 3.25$ psi

After calculation of pressure loss for other nodes of the same path,

- Total pressure loss:
  $0.52 + 1.20 + 1.83 + 2.13 + 3.25 + 2.04 + 3.25 = 14.21$ psi
- Initial pressure at OHT: 40 psi
- Hence, available pressure: $40 - 14.21 = 25.79$ psi $[< 30$ psi$]$
- Therefore, pipe diameter has to be reconsidered
- After reconsideration, new pressure loss:
  $0.30 + 0.53 + 0.81 + 0.95 + 1.22 + 0.76 + 1.22 = 5.80$ psi
- Available pressure: $40 - 5.80 = 34.2$ psi $[\geq 30$ psi$]$

Zone 1: Residential, Commercial, Administrative

Initial Pipe Diameter

Node	Length (ft)	Peak Demand (klpd)	Peak Demand (ft^3/s)	Pipe Area (in^2)	Required Diameter (in)	Provided Diameter (in)
23, 24	130.0	0.7	0.000286	0.01	0.13	1.5
22, 23	162.5	7	0.002861	0.14	0.42	1.5
21, 22	195.0	40.1	0.016390	0.79	1.00	1.5
20, 21	117.5	71.5	0.029225	1.40	1.34	1.5
25, 26	130.0	2.7	0.001104	0.05	0.26	1.5
20, 25	85.0	3.3	0.001349	0.06	0.29	1.5
17, 20	168.0	74.8	0.030573	1.47	1.37	1.5
18, 19	130.0	4.6	0.001880	0.09	0.34	1.5
17, 18	85.0	53.9	0.022031	1.06	1.16	1.5
11, 17	168.0	128.7	0.052604	2.52	1.79	2
15, 16	134.0	4.6	0.001880	0.09	0.34	1.5
14, 15	138.5	108	0.044143	2.12	1.64	2
13, 14	125.0	109.1	0.044593	2.14	1.65	2
12, 13	85.0	110.9	0.045329	2.18	1.66	2
11, 12	82.6	111.9	0.045737	2.20	1.67	2
10, 11	230.0	243.3	0.099445	4.77	2.47	2.5
2, 10	210.0	243.3	0.099445	4.77	2.47	2.5
7, 8	167.5	13.9	0.005681	0.27	0.59	1.5
6, 7	105.0	24.9	0.010177	0.49	0.79	1.5
5, 6	167.5	47.1	0.019251	0.92	1.08	1.5
4, 5	146.7	92	0.037604	1.80	1.52	2
3, 4	125.8	94.7	0.038707	1.86	1.54	2
2, 3	82.5	126.6	0.051746	2.48	1.78	2
2, 9	82.5	0.1	0.000041	0.00	0.05	1.5
1, 2	62.5	370	0.151232	7.26	3.04	3.5

Node	Length (ft)	Peak Demand (klpd)	Peak Demand (ft^3/s)	Pipe Area (in^2)	Required Diameter (in)	Provided Diameter (in)
60, 61	100.0	16.9	0.006908	0.33	0.65	1.5
59, 60	352.0	33.8	0.013815	0.66	0.92	1.5
58, 59	84.0	42.2	0.017249	0.83	1.03	1.5
57, 58	84.0	50.6	0.020682	0.99	1.12	1.5
56, 57	84.0	59	0.024115	1.16	1.21	1.5
55, 56	84.0	67.4	0.027549	1.32	1.30	1.5
54, 55	62.0	75.8	0.030982	1.49	1.38	1.5
64, 65	70.0	13.8	0.005641	0.27	0.59	1.5
63, 64	70.0	27.6	0.011281	0.54	0.83	1.5
62, 63	70.0	41.4	0.016922	0.81	1.02	1.5
54, 62	70.0	55.2	0.022562	1.08	1.17	1.5
40, 54	165.0	131	0.053544	2.57	1.81	2
48, 49	100.0	16.9	0.006908	0.33	0.65	1.5
47, 48	170.0	40.9	0.016717	0.80	1.01	1.5
46, 47	120.0	284.7	0.116367	5.59	2.67	3
45, 46	177.0	284.7	0.116367	5.59	2.67	3
44, 45	84.0	293.1	0.119800	5.75	2.71	3
43, 44	84.0	301.5	0.123233	5.92	2.74	3
42, 43	84.0	309.9	0.126667	6.08	2.78	3
41, 42	84.0	318.3	0.130100	6.24	2.82	3
40, 41	62.0	341.7	0.139665	6.70	2.92	3
52, 53	70.0	27.6	0.011281	0.54	0.83	1.5
51, 52	70.0	55.2	0.022562	1.08	1.17	1.5
50, 51	70.0	82.8	0.033843	1.62	1.44	1.5
40, 50	55.0	110.4	0.045124	2.17	1.66	2
35, 40	220.0	583.1	0.238333	11.44	3.82	4
38, 39	70.0	23.6	0.009646	0.46	0.77	1.5
37, 38	70.0	47.2	0.019292	0.93	1.09	1.5

Node	Length (ft)	Peak Demand (klpd)	Peak Demand (ft^3/s)	Pipe Area (in^2)	Required Diameter (in)	Provided Diameter (in)
36, 37	70.0	70.8	0.028938	1.39	1.33	1.5
35, 36	55.0	94.4	0.038585	1.85	1.54	2
27, 35	155.0	677.5	0.276918	13.29	4.11	4.5
29, 30	502.5	16.1	0.006581	0.32	0.63	1.5
28, 29	207.2	248	0.101366	4.87	2.49	2.5
27, 28	80.3	248.1	0.101407	4.87	2.49	2.5
33, 34	70.0	11.8	0.004823	0.23	0.54	1.5
32, 33	70.0	23.6	0.009646	0.46	0.77	1.5
31, 32	70.0	35.4	0.014469	0.69	0.94	1.5
27, 31	55.0	47.2	0.019292	0.93	1.09	1.5
1, 27	155.0	972.8	0.397617	19.09	4.93	5

Pressure Check: Trial 1

Path	Node	Length (ft)	Diameter (in)	Head Loss (ft)	Pressure Loss (psi)	Total Length (ft)	Total Pressure Loss (psi)	Available Pressure (psi)	Remarks
P01	1, 2	62.5	3.5	1.20	0.52	145.0	2.12	37.88	OK
	2, 9	82.5	1.5	3.69	1.60				
P02	1, 2	62.5	3.5	1.20	0.52	857.5	14.21	25.79	NOT OK (Low Pressure)
	2, 3	82.5	2	2.77	1.20				
	3, 4	125.8	2	4.22	1.83				
	4, 5	146.7	2	4.92	2.13				
	5, 6	167.5	1.5	7.49	3.25				
	6, 7	105.0	1.5	4.70	2.04				
	7, 8	167.5	1.5	7.49	3.25				
P03	1, 2	62.5	3.5	1.20	0.52	1067.6	14.50	25.50	NOT OK (Low Pressure)
	2, 10	210.0	2.5	5.64	2.44				
	10, 11	230.0	2.5	6.17	2.68				
	11, 12	82.6	2	2.77	1.20				
	12, 13	85.0	2	2.85	1.24				
	13, 14	125.0	2	4.19	1.82				
	14, 15	138.5	2	4.65	2.01				
	15, 16	134.0	1.5	5.99	2.60				

Path	Node	Length (ft)	Diameter (in)	Head Loss (ft)	Pressure Loss (psi)	Total Length (ft)	Total Pressure Loss (psi)	Available Pressure (psi)	Remarks
P04	1, 2	62.5	3.5	1.20	0.52	885.5	12.25	27.75	NOT OK (Low Pressure)
	2, 10	210.0	2.5	5.64	2.44				
	10, 11	230.0	2.5	6.17	2.68				
	11, 17	168.0	2	5.64	2.44				
	17, 18	85.0	1.5	3.80	1.65				
	18, 19	130.0	1.5	5.82	2.52				
P05	1, 2	62.5	3.5	1.20	0.52	1443.5	23.06	16.94	NOT OK (Low Pressure)
	2, 10	210.0	2.5	5.64	2.44				
	10, 11	230.0	2.5	6.17	2.68				
	11, 17	168.0	2	5.64	2.44				
	17, 20	168.0	1.5	7.52	3.26				
	20, 21	117.5	1.5	5.26	2.28				
	21, 22	195.0	1.5	8.72	3.78				
	22, 23	162.5	1.5	7.27	3.15				
	23, 24	130.0	1.5	5.82	2.52				
P06	1, 2	62.5	3.5	1.20	0.52	1053.5	15.50	24.50	NOT OK (Low Pressure)
	2, 10	210.0	2.5	5.64	2.44				
	10, 11	230.0	2.5	6.17	2.68				
	11, 17	168.0	2	5.64	2.44				

Path	Node	Length (ft)	Diameter (in)	Head Loss (ft)	Pressure Loss (psi)	Total Length (ft)	Total Pressure Loss (psi)	Available Pressure (psi)	Remarks
	17, 20	168.0	1.5	7.52	3.26				
	20, 25	85.0	1.5	3.80	1.65				
	25, 26	130.0	1.5	5.82	2.52				
P07	1, 27	155.0	5	2.08	0.90	945.0	13.99	26.01	NOT OK (Low Pressure)
	27, 28	80.3	2.5	2.16	0.93				
	28, 29	207.2	2.5	5.56	2.41				
	29, 30	502.5	1.5	22.48	9.74				
P08	1, 27	155.0	5	2.08	0.90	420.0	6.04	33.96	OK
	27, 31	55.0	1.5	2.46	1.07				
	31, 32	70.0	1.5	3.13	1.36				
	32, 33	70.0	1.5	3.13	1.36				
	33, 34	70.0	1.5	3.13	1.36				
P09	1, 27	155.0	5	2.08	0.90	575.0	6.77	33.23	OK
	27, 35	155.0	4.5	2.31	1.00				
	35, 36	55.0	2	1.85	0.80				
	36, 37	70.0	1.5	3.13	1.36				
	37, 38	70.0	1.5	3.13	1.36				
	38, 39	70.0	1.5	3.13	1.36				
P10	1, 27	155.0	5	2.08	0.90	1495.0	15.47	24.53	

Path	Node	Length (ft)	Diameter (in)	Head Loss (ft)	Pressure Loss (psi)	Total Length (ft)	Total Pressure Loss (psi)	Available Pressure (psi)	Remarks
	27, 35	155.0	4.5	2.31	1.00				
	35, 40	220.0	4	3.69	1.60				
	40, 41	62.0	3	1.39	0.60				
	41, 42	84.0	3	1.88	0.81				
	42, 43	84.0	3	1.88	0.81				
	43, 44	84.0	3	1.88	0.81				NOT OK (Low Pressure)
	44, 45	84.0	3	1.88	0.81				
	45, 46	177.0	3	3.96	1.72				
	46, 47	120.0	3	2.68	1.16				
	47, 48	170.0	1.5	7.60	3.30				
	48, 49	100.0	1.5	4.47	1.94				
P11	1, 27	155.0	5	2.08	0.90	795.0	8.37	31.63	OK
	27, 35	155.0	4.5	2.31	1.00				
	35, 40	220.0	4	3.69	1.60				
	40, 50	55.0	2	1.85	0.80				
	50, 51	70.0	1.5	3.13	1.36				
	51, 52	70.0	1.5	3.13	1.36				
	52, 53	70.0	1.5	3.13	1.36				
P12	1, 27	155.0	5	2.08	0.90	1545.0	22.38	17.62	

Path	Node	Length (ft)	Diameter (in)	Head Loss (ft)	Pressure Loss (psi)	Total Length (ft)	Total Pressure Loss (psi)	Available Pressure (psi)	Remarks
	27, 35	155.0	4.5	2.31	1.00				
	35, 40	220.0	4	3.69	1.60				
	40, 54	165.0	2	5.54	2.40				
	54, 55	62.0	1.5	2.77	1.20				
	55, 56	84.0	1.5	3.76	1.63				NOT OK (Low Pressure)
	56, 57	84.0	1.5	3.76	1.63				
	57, 58	84.0	1.5	3.76	1.63				
	58, 59	84.0	1.5	3.76	1.63				
	59, 60	352.0	1.5	15.75	6.82				
	60, 61	100.0	1.5	4.47	1.94				
P13	1, 27	155.0	5	2.08	0.90	975.0	11.33	28.67	NOT OK (Low Pressure)
	27, 35	155.0	4.5	2.31	1.00				
	35, 40	220.0	4	3.69	1.60				
	40, 54	165.0	2	5.54	2.40				
	54, 62	70.0	1.5	3.13	1.36				
	62, 63	70.0	1.5	3.13	1.36				
	63, 64	70.0	1.5	3.13	1.36				

Pressure Check: Trial 2

Path	Node	Length (ft)	Diameter (in)	Head Loss (ft)	Pressure Loss (psi)	Total Length (ft)	Total Pressure Loss (psi)	Available Pressure (psi)	Remarks
P01	1, 2	62.5	6	0.70	0.30	145.0	0.90	39.10	OK
	2, 9	82.5	4	1.38	0.60				
P02	1, 2	62.5	6	0.70	0.30	857.5	5.80	34.20	OK
	2, 3	82.5	4.5	1.23	0.53				
	3, 4	125.8	4.5	1.88	0.81				
	4, 5	146.7	4.5	2.19	0.95				
	5, 6	167.5	4	2.81	1.22				
	6, 7	105.0	4	1.76	0.76				
	7, 8	167.5	4	2.81	1.22				
P03	1, 2	62.5	6	0.70	0.30	1067.6	6.62	33.38	OK
	2, 10	210.0	5	2.82	1.22				
	10, 11	230.0	5	3.09	1.34				
	11, 12	82.6	4.5	1.23	0.53				
	12, 13	85.0	4.5	1.27	0.55				
	13, 14	125.0	4.5	1.86	0.81				
	14, 15	138.5	4.5	2.07	0.89				
	15, 16	134.0	4	2.25	0.97				

Path	Node	Length (ft)	Diameter (in)	Head Loss (ft)	Pressure Loss (psi)	Total Length (ft)	Total Pressure Loss (psi)	Available Pressure (psi)	Remarks
P04	1, 2	62.5	6	0.70	0.30	885.5	5.51	34.49	OK
	2, 10	210.0	5	2.82	1.22				
	10, 11	230.0	5	3.09	1.34				
	11, 17	168.0	4.5	2.51	1.09				
	17, 18	85.0	4	1.43	0.62				
	18, 19	130.0	4	2.18	0.95				
P05	1, 2	62.5	6	0.70	0.30	1443.5	9.57	30.43	OK
	2, 10	210.0	5	2.82	1.22				
	10, 11	230.0	5	3.09	1.34				
	11, 17	168.0	4.5	2.51	1.09				
	17, 20	168.0	4	2.82	1.22				
	20, 21	117.5	4	1.97	0.85				
	21, 22	195.0	4	3.27	1.42				
	22, 23	162.5	4	2.73	1.18				
	23, 24	130.0	4	2.18	0.95				
P06	1, 2	62.5	6	0.70	0.30	1053.5	6.73	33.27	OK
	2, 10	210.0	5	2.82	1.22				
	10, 11	230.0	5	3.09	1.34				
	11, 17	168.0	4.5	2.51	1.09				

Path	Node	Length (ft)	Diameter (in)	Head Loss (ft)	Pressure Loss (psi)	Total Length (ft)	Total Pressure Loss (psi)	Available Pressure (psi)	Remarks
	17, 20	168.0	4	2.82	1.22				
	20, 25	85.0	4	1.43	0.62				
	25, 26	130.0	4	2.18	0.95				
P07	1, 27	155.0	7.5	1.39	0.60	945.0	5.93	34.07	OK
	27, 28	80.3	5	1.08	0.47				
	28, 29	207.2	5	2.78	1.20				
	29, 30	502.5	4	8.43	3.65				
P08	1, 27	155.0	7.5	1.39	0.60	420.0	2.53	37.47	OK
	27, 31	55.0	4	0.92	0.40				
	31, 32	70.0	4	1.17	0.51				
	32, 33	70.0	4	1.17	0.51				
	33, 34	70.0	4	1.17	0.51				
P09	1, 27	155.0	7.5	1.39	0.60	575.0	3.13	36.87	OK
	27, 35	155.0	7	1.49	0.64				
	35, 36	55.0	4.5	0.82	0.36				
	36, 37	70.0	4	1.17	0.51				
	37, 38	70.0	4	1.17	0.51				
	38, 39	70.0	4	1.17	0.51				
P10	1, 27	155.0	7.5	1.39	0.60	1495.0	7.87	32.13	OK

Path	Node	Length (ft)	Diameter (in)	Head Loss (ft)	Pressure Loss (psi)	Total Length (ft)	Total Pressure Loss (psi)	Available Pressure (psi)	Remarks
	27, 35	155.0	7	1.49	0.64				
	35, 40	220.0	6.5	2.27	0.98				
	40, 41	62.0	5.5	0.76	0.33				
	41, 42	84.0	5.5	1.02	0.44				
	42, 43	84.0	5.5	1.02	0.44				
	43, 44	84.0	5.5	1.02	0.44				
	44, 45	84.0	5.5	1.02	0.44				
	45, 46	177.0	5.5	2.16	0.94				
	46, 47	120.0	5.5	1.46	0.63				
	47, 48	170.0	4	2.85	1.24				
	48, 49	100.0	4	1.68	0.73				
P11	1, 27	155.0	7.5	1.39	0.60	795.0	4.11	35.89	OK
	27, 35	155.0	7	1.49	0.64				
	35, 40	220.0	6.5	2.27	0.98				
	40, 50	55.0	4.5	0.82	0.36				
	50, 51	70.0	4	1.17	0.51				
	51, 52	70.0	4	1.17	0.51				
	52, 53	70.0	4	1.17	0.51				
P12	1, 27	155.0	7.5	1.39	0.60	1545.0	9.47	30.53	OK

Path	Node	Length (ft)	Diameter (in)	Head Loss (ft)	Pressure Loss (psi)	Total Length (ft)	Total Pressure Loss (psi)	Available Pressure (psi)	Remarks
	27, 35	155.0	7	1.49	0.64				
	35, 40	220.0	6.5	2.27	0.98				
	40, 54	165.0	4.5	2.46	1.07				
	54, 55	62.0	4	1.04	0.45				
	55, 56	84.0	4	1.41	0.61				
	56, 57	84.0	4	1.41	0.61				
	57, 58	84.0	4	1.41	0.61				
	58, 59	84.0	4	1.41	0.61				
	59, 60	352.0	4	5.90	2.56				
	60, 61	100.0	4	1.68	0.73				
P13	1, 27	155.0	7.5	1.39	0.60	975.0	5.33	34.67	OK
	27, 35	155.0	7	1.49	0.64				
	35, 40	220.0	6.5	2.27	0.98				
	40, 54	165.0	4.5	2.46	1.07				
	54, 62	70.0	4	1.17	0.51				
	62, 63	70.0	4	1.17	0.51				
	63, 64	70.0	4	1.17	0.51				
	64, 65	70.0	4	1.17	0.51				

Zone 2: Industrial

Initial Pipe Diameter

Node	Length (ft)	Peak Demand (klpd)	Peak Demand (ft^2/s)	Pipe Area (in^2)	Required Diameter (in)	Provided Diameter (in)
13, 14	230.0	0.1	0.000041	0.0020	0.05	1.5
13, 15	380.0	0.1	0.000041	0.0020	0.05	1.5
12, 13	265.0	0.2	0.000082	0.0039	0.07	1.5
11, 12	150.0	62.3	0.025464	1.2223	1.25	1.5
10, 11	265.0	103.3	0.042222	2.0267	1.61	2
2, 10	170.0	312.7	0.127811	6.1349	2.79	3
8, 9	425.0	11	0.004496	0.2158	0.52	1.5
7, 8	170.0	11.2	0.004578	0.2197	0.53	1.5
6, 7	165.0	11.7	0.004782	0.2295	0.54	1.5
5, 6	150.0	93.6	0.038258	1.8364	1.53	2
4, 5	260.0	258.5	0.105658	5.0716	2.54	3
3, 4	230.0	974.7	0.398394	19.1229	4.93	5
2, 3	230.0	1009.2	0.412495	19.7998	5.02	5.5
1, 2	90.0	1322	0.540347	25.9367	5.75	6
18, 19	190.0	716.2	0.292736	14.0513	4.23	4.5
17, 18	365.0	716.5	0.292858	14.0572	4.23	4.5
17, 20	230.0	0.4	0.000163	0.0078	0.10	1.5
16, 17	85.0	716.9	0.293022	14.0650	4.23	4.5
1, 16	165.0	739	0.302055	14.4986	4.30	4.5

Pressure Check: Trial 1

Path	Node	Length (ft)	Diameter (in)	Head Loss (ft)	Pressure Loss (psi)	Total Length (ft)	Total Pressure Loss (psi)	Available Pressure (psi)	Remarks
P01	1, 2	90.0	6	1.01	0.44	1720.0	22.42	17.58	NOT OK (Low Pressure)
	2, 3	230.0	5.5	2.81	1.22				
	3, 4	230.0	5	3.09	1.34				
	4, 5	260.0	3	5.82	2.52				
	5, 6	150.0	2	5.03	2.18				
	6, 7	165.0	1.5	7.38	3.20				
	7, 8	170.0	1.5	7.60	3.30				
	8, 9	425.0	1.5	19.01	8.24				
P02	1, 2	90.0	6	1.01	0.44	1170.0	18.44	21.56	NOT OK (Low Pressure)
	2, 10	170.0	3	3.80	1.65				
	10, 11	265.0	2	8.89	3.85				
	11, 12	150.0	1.5	6.71	2.91				
	12, 13	265.0	1.5	11.85	5.14				
	13, 14	230.0	1.5	10.29	4.46				
P03	1, 2	90.0	6	1.01	0.44	1320.0	21.35	18.65	NOT OK (Low Pressure)
	2, 10	170.0	3	3.80	1.65				
	10, 11	265.0	2	8.89	3.85				

Path	Node	Length (ft)	Diameter (in)	Head Loss (ft)	Pressure Loss (psi)	Total Length (ft)	Total Pressure Loss (psi)	Available Pressure (psi)	Remarks
	11, 12	150.0	1.5	6.71	2.91				
	12, 13	265.0	1.5	11.85	5.14				
	13, 15	380.0	1.5	17.00	7.37				
P04	1, 16	165.0	4.5	2.46	1.07	805.0	5.20	34.80	OK
	16, 17	85.0	4.5	1.27	0.55				
	17, 18	365.0	4.5	5.44	2.36				
	18, 19	190.0	4.5	2.83	1.23				
P05	1, 16	165.0	4.5	2.46	1.07	480.0	6.07	33.93	OK
	16, 17	85.0	4.5	1.27	0.55				
	17, 20	230.0	1.5	10.29	4.46				

Pressure Check: Trial 2

Path	Node	Length (ft)	Diameter (in)	Head Loss (ft)	Pressure Loss (psi)	Total Length (ft)	Total Pressure Loss (psi)	Available Pressure (psi)	Remarks
P01	1, 2	90.0	8.5	0.71	0.31	1720.0	9.90	30.10	OK
	2, 3	230.0	8	1.93	0.84				
	3, 4	230.0	7.5	2.06	0.89				
	4, 5	260.0	5.5	3.17	1.37				
	5, 6	150.0	4.5	2.24	0.97				
	6, 7	165.0	4	2.77	1.20				
	7, 8	170.0	4	2.85	1.24				
	8, 9	425.0	4	7.13	3.09				
P02	1, 2	90.0	8.5	0.71	0.31	1170.0	7.61	32.39	OK
	2, 10	170.0	5.5	2.07	0.90				
	10, 11	265.0	4.5	3.95	1.71				
	11, 12	150.0	4	2.52	1.09				
	12, 13	265.0	4	4.45	1.93				
	13, 14	230.0	4	3.86	1.67				
P03	1, 2	90.0	8.5	0.71	0.31	1320.0	8.70	31.30	OK
	2, 10	170.0	5.5	2.07	0.90				
	10, 11	265.0	4.5	3.95	1.71				

Path	Node	Length (ft)	Diameter (in)	Head Loss (ft)	Pressure Loss (psi)	Total Length (ft)	Total Pressure Loss (psi)	Available Pressure (psi)	Remarks
	11, 12	150.0	4	2.52	1.09				
	12, 13	265.0	4	4.45	1.93				
	13, 15	380.0	4	6.37	2.76				
P04	1, 16	165.0	4.5	2.46	1.07	805.0	5.20	34.80	OK
	16, 17	85.0	4.5	1.27	0.55				
	17, 18	365.0	4.5	5.44	2.36				
	18, 19	190.0	4.5	2.83	1.23				
P05	1, 16	165.0	4.5	2.46	1.07	480.0	6.07	33.93	OK
	16, 17	85.0	4.5	1.27	0.55				
	17, 20	230.0	1.5	10.29	4.46				