CALCULATION SUMMARY

Project Name : KIRKLAND TOWNHOMES

Project Location: 10143 64TH STREET

Drawing No. :

City: KIRKLAND, WA

DOMESTIC
ALLOWANCE PER
NFPA #13D

Design Areas

Design Area Name	Calc. Mode (Model)	Occupancy	Area of Application	Total Water	Pressure @ Source	Min. Density	Min. Pressure	Min. Flow	Calculated Heads	Hose Streams	Margin To Source
			(ft²)	(gpm)	(psi)	(gpm/ft²)	(psi)	(gpm)	#	(gpm)	(psi)
1	Demand (HW)	DWELLING- 13D	648	39.2	90.3	0.052	12	17	2	5	23.9

WASHINGTON STATE
CERTIFICATE OF COMPETENCY
FIRE PROTECTION SPRINKLER SYSTEMS

David Yates
2605-0898-C Level 3
BFPS, L. L. C.
BFPSLL *929MA

Signature

Expires 12/31/15

7/3/15
Date

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HYDRAULIC CALCULATIONS
for

Job Information

Project Name : KIRKLAND TOWNHOMES

Contract No. :

City: KIRKLAND, WA

Project Location: 10143 64TH STREET

Date: 6/26/2015

Contractor Information

Name of Contractor: BURNS FIRE PROTECTION SYSTEMS

Address: P.O.B. 11021

City: GRANITE FALLS, WA

Phone Number: 425-388-0124

E-mail:

Name of Designer: D.YATES

Authority Having Jurisdiction: CITY OF KIRKLAND

Design

Remote Area Name	1
Remote Area Location	UPPER LEVEL SOUTH UNIT
Occupancy Classification	DWELLING- 13D
Density (gpm/ft²)	0.052
Area of Application (ft²)	648
Coverage per Sprinkler (ft²)	324
Number of Calculated Sprinklers	2
In-Rack Demand (gpm)	0
Special Heads	
Hose Streams (gpm)	5
Total Water Required (incl. Hose Streams) (gpm)	39.2
Required Pressure at Source (psi)	66.4
Type of System	Wet
Volume - Entire System (gal)	23.1 gal

Water Supply Information

Date	7/2/15
Location	HYDRANT ON N.E. 64TH ST.
Source	W1

Notes

REMOTE 2 SPRINKLERS FLOWING

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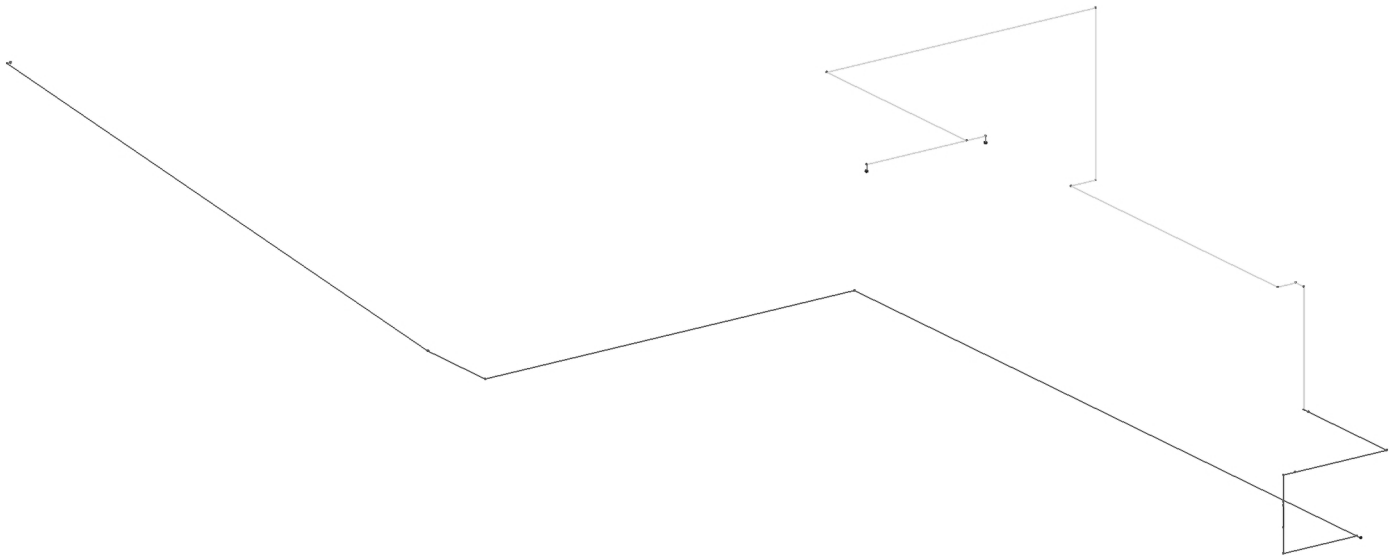
Node Labels: Off
Pipe Labels: Off

Diagram for Design Area : 1
(Optimized Hydraulic Simplified)



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Hydraulic Analysis for : 1

Calculation Info

Calculation Mode	Demand
Hydraulic Model	Hazen-Williams
Fluid Name	Water @ 60F (15.6C)
Fluid Weight, (lb/ft³)	N/A for Hazen-Williams calculation.
Fluid Dynamic Viscosity, (lb·s/ft²)	N/A for Hazen-Williams calculation.

Water Supply Parameters

Supply 1 : W1

Flow (gpm)	Pressure (psi)
0	90.4
1500	20

Hoses

Inside Hose Flow / Standpipe Demand (gpm)	5
Outside Hose Flow (gpm)	0
Additional Outside Hose Flow (gpm)	
Other (custom defined) Hose Flow (gpm)	0
Total Hose Flow (gpm)	5

Sprinklers

Ovehead Sprinkler Flow (gpm)	34.2
InRack Sprinkler Flow (gpm)	0
Other (custom defined) Sprinkler Flow (gpm)	0
Total Sprinkler Flow (gpm)	34.2

Other

Required Margin of Safety (%)	10
W1 - Pressure (psi)	66.4
W1 - Flow (gpm)	39.2
Demand w/o System Pump(s)	N/A

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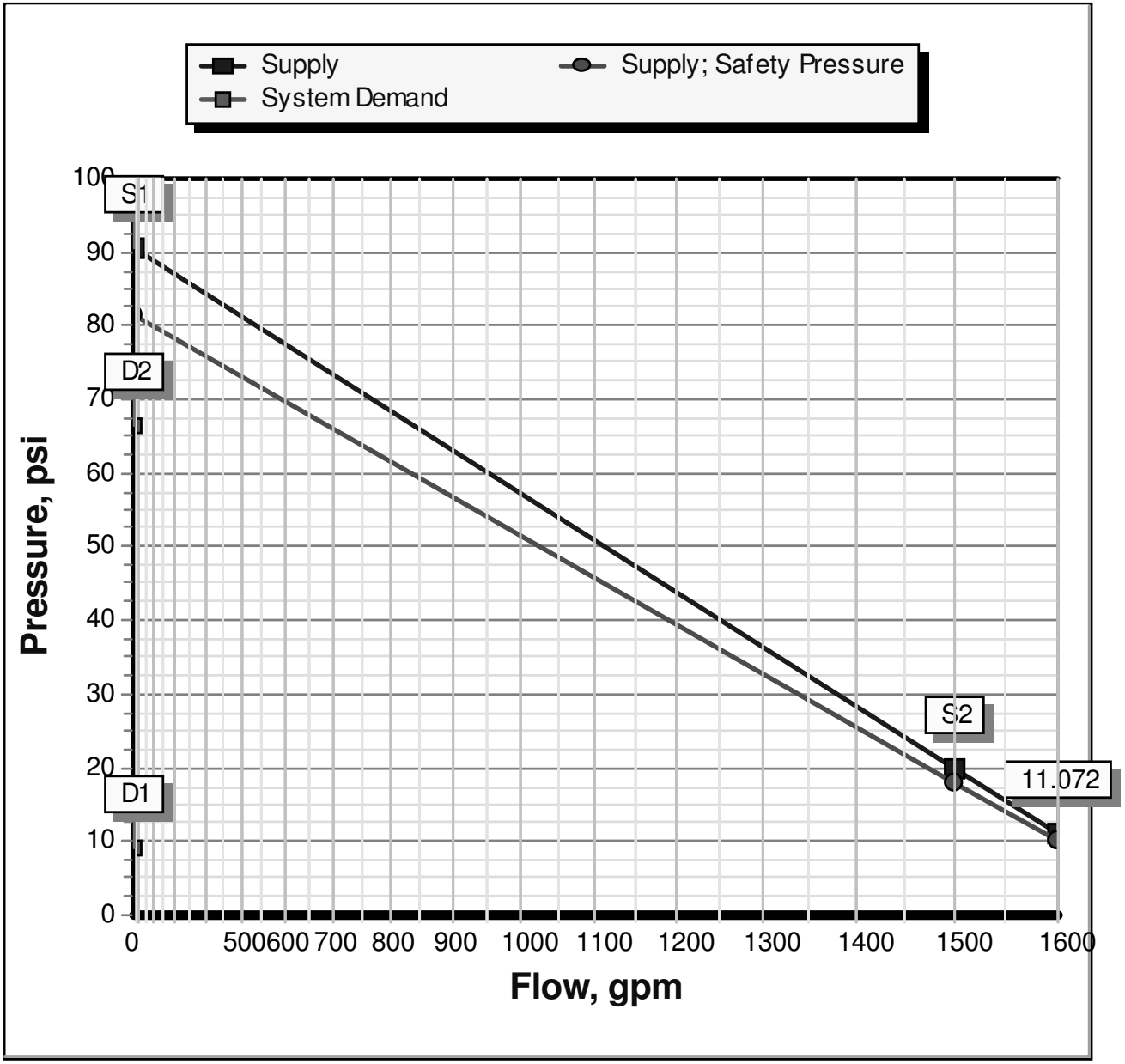
Hydraulic Analysis for : 1



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Hydraulic Analysis for : 1

Graph Labels

Label	Description	Values	
		Flow (gpm)	Pressure (psi)
S1	Supply point #1 - Static	0	90.4
S2	Supply point #2 - Residual	1500	20
D1	Elevation Pressure	0	9
D2	System Demand	39.2	66.4

Curve Intersections & Safety Margins

Curve Name	Intersection		Safety Margin	
	Pressure (psi)	Flow (gpm)	Pressure (psi)	@ Flow (gpm)
Supply	90.3	47.3	23.9	39.2
Supply; Safety Pressure	81.3	44.4	14.9	39.2

Open Heads

Head Ref.	Head Type	Coverage	K-Factor	Required			Calculated		
				Density	Flow	Pressure	Density	Flow	Pressure
		(ft²)	(gpm/psi½)	(gpm/ft²)	(gpm)	(psi)	(gpm/ft²)	(gpm)	(psi)
101	Overhead Sprinkler	324	4.9	0.05	16.2	12	0.052	17	12
102	Overhead Sprinkler	324	4.9	0.05	16.2	12	0.053	17.2	12.3

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Node Data

Node# Type	Hgroup Fitting	K-Fact. Stat. Pres.	Elev Coverage	X Y
		gpm/psi½ psi	ft ft²	ft ft
101 Overhead Sprinkler	HEAD	4.9 0	29.88 324	-233.54 510.84
102 Overhead Sprinkler	HEAD	4.9 0	29.88 324	-223.54 510.84
003 Node	NODE BM.Tee	0	30.36	-225.13 510.84
130 Node	NODE BM.Tee	0	8.75	-203.1 501.25
020 Node	NODE coupling	0	8.75	-210.82 491.84
022 Node	NODE coupling	0	6.82	-211.82 491.84
023-O Node	NODE coupling	0	6.51	-211.82 491.84
023-I Node	NODE coupling	0	4.9	-211.82 491.84
024 Node	NODE BM.90	0	3	-211.82 491.84
D3 Inside Hose	HOSE	0	3	-205.64 491.34
001 Node	NODE BM.Tee	0	3	-205.64 491.84
028-O Node	NODE coupling	0	3	-236.69 558.98
W1 Supply	SUPPLY	0	9	-236.41 609.55
028-I Node	NODE coupling	0	3.01	-236.69 559.09

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Pipe Data

Pipe Ref.	Type	Start	End	Size	HWC	Length	Fittings	Eq.Len.	Total Len.	Schedule	Velocity
						ft		ft	ft		ft/s
001	Brline	003	101	1	150	8.89	1(BM.Tee-Br);1(BM.90);	10	18.89	CPVC	5.72
045	Cmain	130	003	1	150	90.93	7(BM.Tee-Run);5(BM.90);3(BM.Tee-Br);	47	137.93	CPVC	11.52
069	Cmain	020	130	1.25	150	17.14	1(coupling);1(BM.Tee-Run);1(BM.90);	7	24.14	CPVC	7.18
071	Cmain	022	020	1.25	120	2.93	1(coupling);1(bigstd90);	3	5.93	40	7.33
072	Cmain	023-O	022	1.25	150	0.3	1(coupling);			CPVC	7.18
263	BFP	023-I	023-O	1.25	0	1.61				WILKINS 350	0
073	Cmain	024	023-I	1.25	150	1.9	1(BM.90);	6	7.9	CPVC	7.18
074	Cmain	001	024	1.5	150	6.18	1(BM.Tee-Br);	8	14.18	CPVC	5.47
078	Cmain	028-O	001	1.5	150	98.15	1(coupling);2(BM.90);	16	114.15	CPVC	6.27
264	VALVE	028-I	028-O	1	0	0.1				Sensus Meter	0
179	Cmain	W1	028-I	1.5	150	51.14	1(BM.Tee-Br);	8	59.14	CPVC	6.27
198	Brline	003	102	1	150	2.09	1(BM.Tee-Br);1(BM.90);	10	12.09	CPVC	5.8
075	Cmain	001	D3	1.5	150	0.5	1(BM.Tee-Run);	1	1.5	CPVC	0.8

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PIPE INFORMATION

Node 1 Node 2	Elev 1 Elev 2	K-Factor 1 K-Factor 2	Flow added(q)* Total flow (Q)	Nominal ID Actual ID	Fittings quantity x (name) = length	L F T	C Factor Pf per ft	total (Pt) elev (Pe) frict (Pf)	NOTES
	(ft)	(gpm/psi½)	(gpm)	(in)	(ft)	(ft)	(psi)	(psi)	
101 003	29.88 30.36	4.9	17 17	1 1.101	1x(BM.Tee-Br)=5 1x(BM.90)=5	8.89 10 18.89	150 0.05	12 -0.2 0.9	
003 130	30.36 8.75		17.2 34.2	1 1.101	7x(BM.Tee-Run)=7 5x(BM.90)=25 3x(BM.Tee-Br)=15	90.93 47 137.93	150 0.1828	12.7 9.4 25.2	
130 020	8.75 8.75		0 34.2	1.25 1.394	1x(BM.Tee-Run)=1 1x(BM.90)=6	17.14 7 24.14	150 0.0579	47.3 0 1.4	
020 022	8.75 6.82		0 34.2	1.25 1.38	1x(bigstd90)=3	2.93 3 5.93	120 0.092	48.7 0.8 0.5	
022 023-O	6.82 6.51		0 34.2	1.25 1.394		0.3 0 0.3	150 0.0579	50.1 0.1 0.0	
023-O 023-I	6.51 4.9		0 34.2	1.25 0		1.61 0 1.61	0 3.0733	50.2 0.7 5	WILKINS 350
023-I 024	4.9 3		0 34.2	1.25 1.394	1x(BM.90)=6	1.9 6 7.9	150 0.0579	55.9 0.8 0.5	
024 001	3 3		0 34.2	1.5 1.598	1x(BM.Tee-Br)=8	6.18 8 14.18	150 0.0298	57.2 0 0.4	
001 028-O	3 3		5 39.2	1.5 1.598	2x(BM.90)=16	98.15 16 114.15	150 0.0384	57.6 0 4.4	
028-O 028-I	3 3.01		0 39.2	1 0		0.1 0 0.1	0 45.0585	62 0 4.7	Sensus Meter
028-I W1	3.01 9		0 39.2	1.5 1.598	1x(BM.Tee-Br)=8	51.14 8 59.14	150 0.0384	66.7 -2.6 2.3	
102 003	29.88 30.36	4.9	17.2 17.2	1 1.101	1x(BM.Tee-Br)=5 1x(BM.90)=5	2.09 10 12.09	150 0.0513	12.3 -0.2 0.6	
D3 001	3 3		5 5	1.5 1.598	1x(BM.Tee-Run)=1	0.5 1 1.5	150 0.0008	57.6 0 0	

* Discharge shown for flowing nodes only

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PIPE INFORMATION

Node 1 Node 2	Elev 1 Elev 2	K-Factor 1 K-Factor 2	Flow added (q) Total flow (Q)	Nominal ID Actual ID	Fittings quantity x (name) = length	L F T	C Factor Pf per ft	total (Pt) elev (Pe) frict (Pf)	NOTES
	(ft)	(gpm/psi½)	(gpm)	(in)	(ft)	(ft)	(psi)	(psi)	

Path No: 1

101 003	29.88 30.36	4.9	17 17	1 1.101	1x(BM.Tee-Br)=5 1x(BM.90)=5	8.89 10 18.89	150 0.05	12 -0.2 0.9	
003 130	30.36 8.75		17.2 34.2	1 1.101	7x(BM.Tee-Run)=7 5x(BM.90)=25 3x(BM.Tee-Br)=15	90.93 47 137.93	150 0.1828	12.7 9.4 25.2	
130 020	8.75 8.75		0 34.2	1.25 1.394	1x(BM.Tee-Run)=1 1x(BM.90)=6	17.14 7 24.14	150 0.0579	47.3 0 1.4	
020 022	8.75 6.82		0 34.2	1.25 1.38	1x(bigstd90)=3	2.93 3 5.93	120 0.092	48.7 0.8 0.5	
022 023-O	6.82 6.51		0 34.2	1.25 1.394		0.3 0 0.3	150 0.0579	50.1 0.1 0.0	
023-O 023-I	6.51 4.9		0 34.2	1.25 0		1.61 0 1.61	0 3.0733	50.2 0.7 5	WILKINS 350
023-I 024	4.9 3		0 34.2	1.25 1.394	1x(BM.90)=6	1.9 6 7.9	150 0.0579	55.9 0.8 0.5	
024 001	3 3		0 34.2	1.5 1.598	1x(BM.Tee-Br)=8	6.18 8 14.18	150 0.0298	57.2 0 0.4	
001 028-O	3 3		5 39.2	1.5 1.598	2x(BM.90)=16	98.15 16 114.15	150 0.0384	57.6 0 4.4	
028-O 028-I	3 3.01		0 39.2	1 0		0.1 0 0.1	0 45.0585	62 0 4.7	Sensus Meter
028-I W1	3.01 9		0 39.2	1.5 1.598	1x(BM.Tee-Br)=8	51.14 8 59.14	150 0.0384	66.7 -2.6 2.3	
W1								**66.4**	

Path No: 2

102 003	29.88 30.36	4.9	17.2 17.2	1 1.101	1x(BM.Tee-Br)=5 1x(BM.90)=5	2.09 10 12.09	150 0.0513	12.3 -0.2 0.6	
003								**12.7**	

Path No: 3

D3 001	3 3		5 5	1.5 1.598	1x(BM.Tee-Run)=1	0.5 1 1.5	150 0.0008	57.6 0 0	
001								**57.6**	

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PIPE INFORMATION

Node 1 Node 2	Elev 1 Elev 2	K-Factor 1 K-Factor 2	Flow added (q) Total flow (Q)	Nominal ID Actual ID	Fittings quantity x (name) = length	L F T	C Factor Pf per ft	total (Pt) elev (Pe) frict (Pf)	NOTES
	(ft)	(gpm/psi½)	(gpm)	(in)	(ft)	(ft)	(psi)	(psi)	

* Pressures are balanced to a high degree of accuracy. Values may vary by 0.1 psi due to display rounding.

* Maximum Velocity of 11.52 ft/s occurs in the following pipe(s): (130-003)

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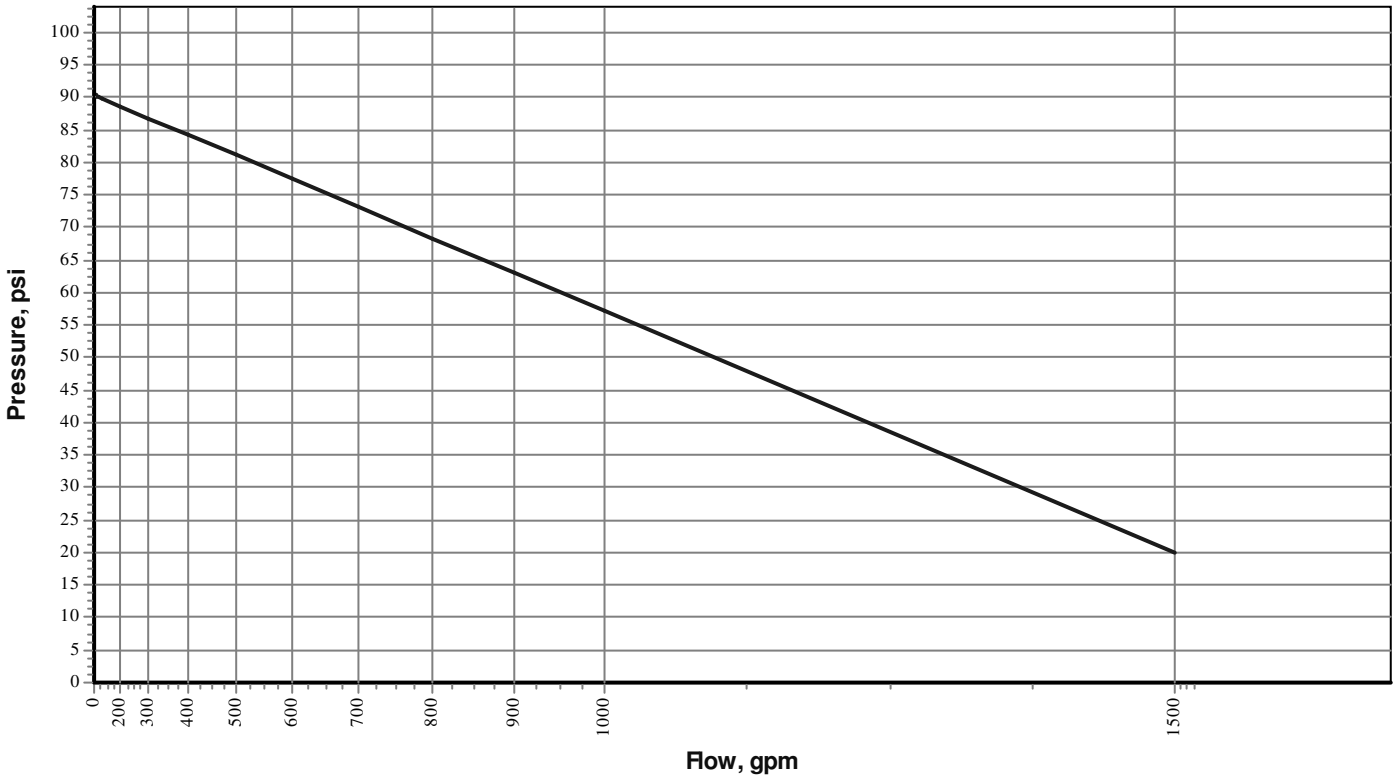
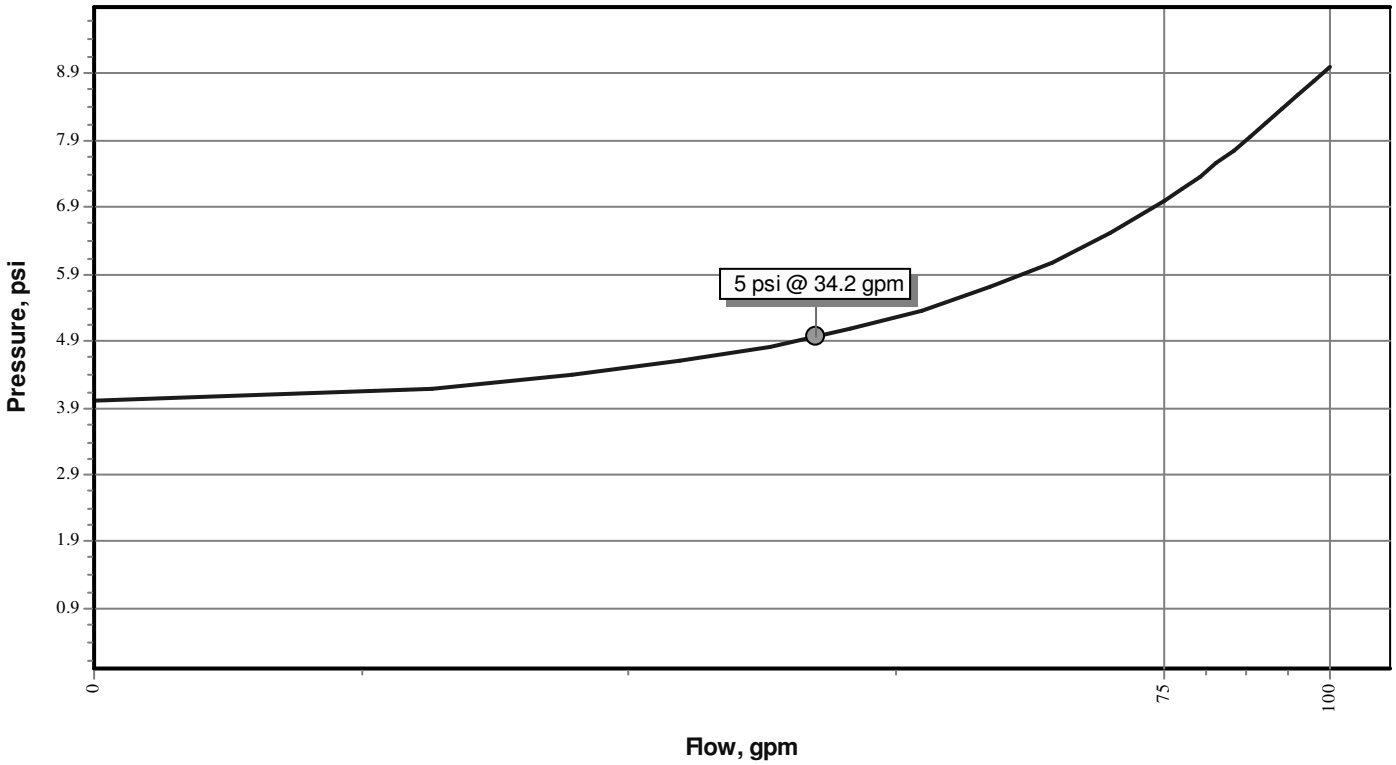
Pressure vs. Flow Function
Design Area: 1; Supply Ref.: W1; Supply Name:W1



Pressure Loss Function
Design Area: 1; BFP Ref.: 263 (WILKINS 350, Size = 1.25)



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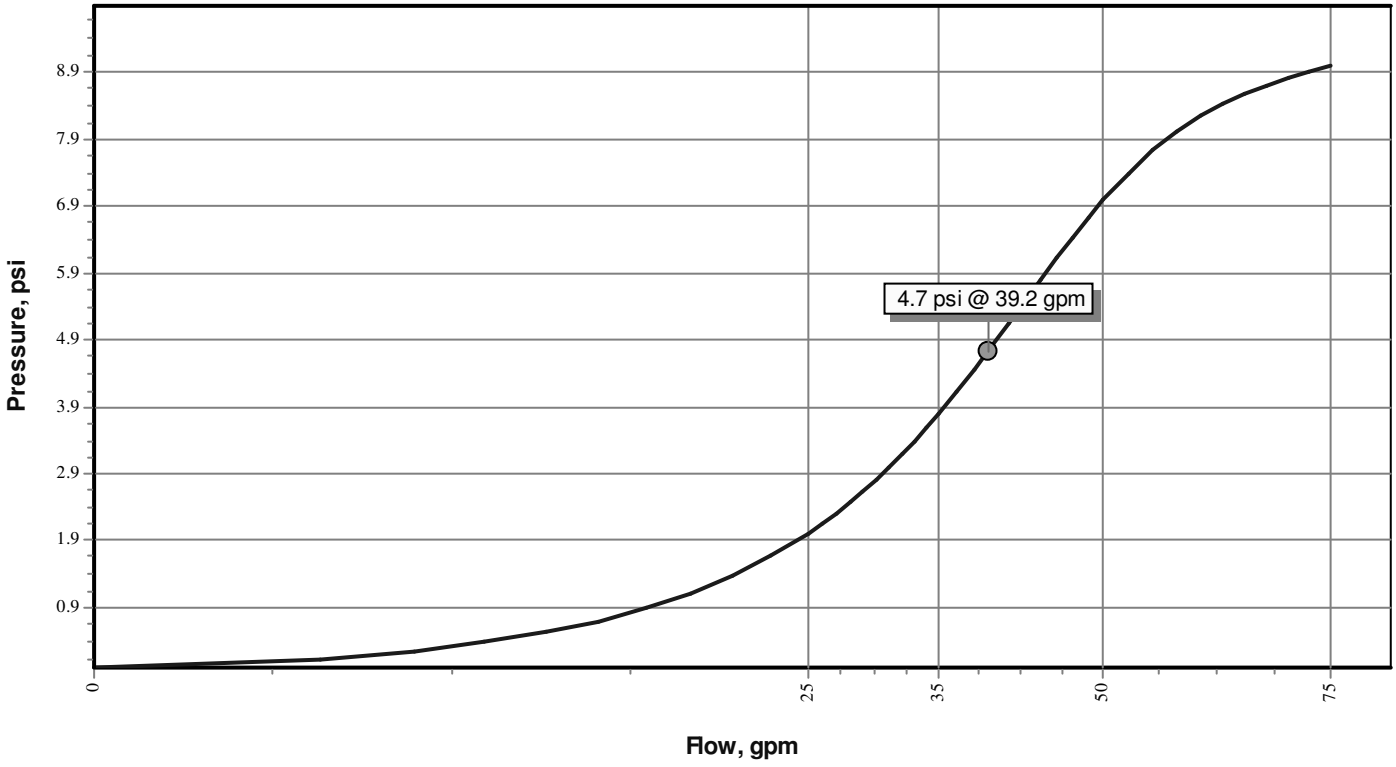
Pressure Loss Function
Design Area: 1; Valve Ref.: 264 (Sensus Meter, Size = 1)



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CALCULATION SUMMARY

Project Name : KIRKLAND TOWNHOMES

Project Location: 10143 64TH STREET

Drawing No. :

City: KIRKLAND, WA

DOMESTIC
ALLOWANCE
PER NFPA 13D

Design Areas

Design Area Name	Calc. Mode (Model)	Occupancy	Area of Application	Total Water	Pressure @ Source	Min. Density	Min. Pressure	Min. Flow	Calculated Heads	Hose Streams	Margin To Source
			(ft²)	(gpm)	(psi)	(gpm/ft²)	(psi)	(gpm)	#	(gpm)	(psi)
2	Demand (HW)	DWELLING- 13D	648	39.2	90.3	0.052	12	17	2	5	24.6

WASHINGTON STATE
CERTIFICATE OF COMPETENCY
FIRE PROTECTION SPRINKLER SYSTEMS

David Yates
2605-0898-C Level 3
BFPS, L. L. C.
BFPSLL *929MA

Signature

Expires 12/31/15

7/3/15
Date

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HYDRAULIC CALCULATIONS
for

Job Information

Project Name : KIRKLAND TOWNHOMES

Contract No. :

City: KIRKLAND, WA

Project Location: 10143 64TH STREET

Date: 6/26/2015

Contractor Information

Name of Contractor: BURNS FIRE PROTECTION SYSTEMS

Address: P.O.B. 11021

City: GRANITE FALLS, WA

Phone Number: 425-388-0124

E-mail:

Name of Designer: D.YATES

Authority Having Jurisdiction: CITY OF KIRKLAND

Design

Remote Area Name	2
Remote Area Location	UPPER LEVEL NORTH UNIT
Occupancy Classification	DWELLING- 13D
Density (gpm/ft²)	0.052
Area of Application (ft²)	648
Coverage per Sprinkler (ft²)	324
Number of Calculated Sprinklers	2
In-Rack Demand (gpm)	0
Special Heads	
Hose Streams (gpm)	5
Total Water Required (incl. Hose Streams) (gpm)	39.2
Required Pressure at Source (psi)	65.7
Type of System	Wet
Volume - Entire System (gal)	21.2 gal

Water Supply Information

Date	7/2/15
Location	HYDRANT ON N.E. 64TH ST.
Source	W1

Notes

REMOTE 2 SPRINKLERS FLOWING

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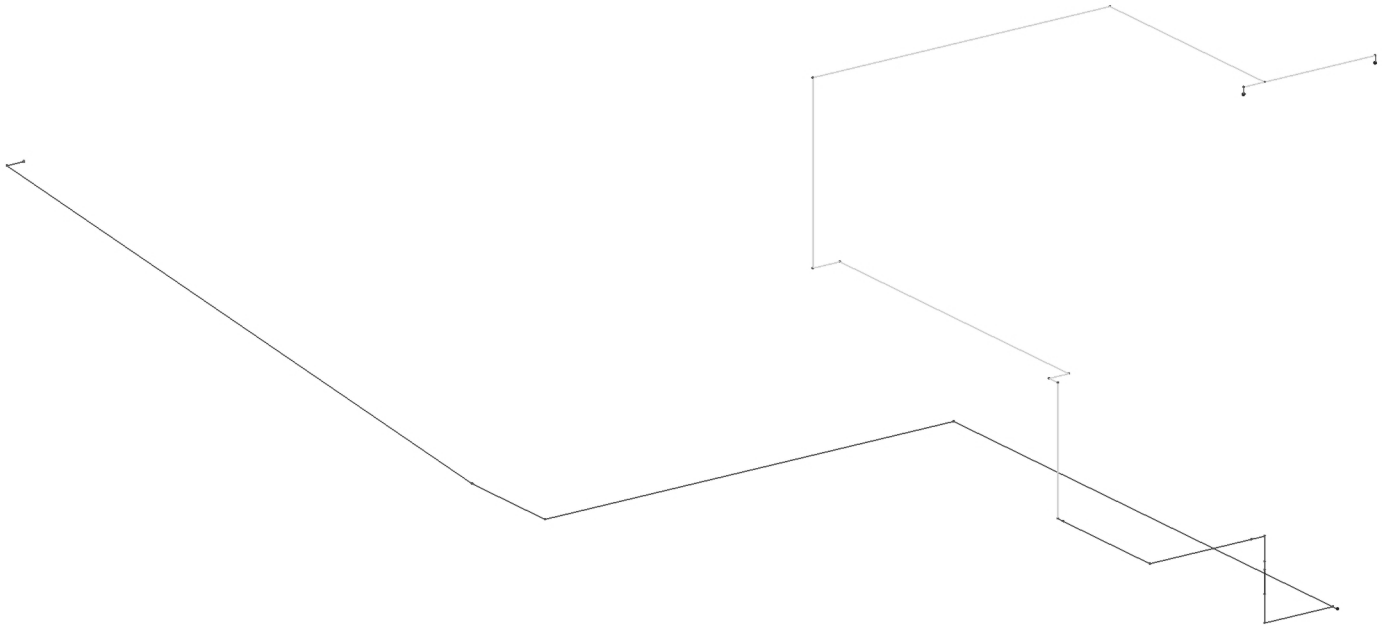
Node Labels: Off
Pipe Labels: Off

Diagram for Design Area : 2
(Optimized Hydraulic Simplified)



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Hydraulic Analysis for : 2

Calculation Info

Calculation Mode	Demand
Hydraulic Model	Hazen-Williams
Fluid Name	Water @ 60F (15.6C)
Fluid Weight, (lb/ft³)	N/A for Hazen-Williams calculation.
Fluid Dynamic Viscosity, (lb·s/ft²)	N/A for Hazen-Williams calculation.

Water Supply Parameters

Supply 1 : W1

Flow (gpm)	Pressure (psi)
0	90.4
1500	20

Hoses

Inside Hose Flow / Standpipe Demand (gpm)	5
Outside Hose Flow (gpm)	0
Additional Outside Hose Flow (gpm)	
Other (custom defined) Hose Flow (gpm)	0
Total Hose Flow (gpm)	5

Sprinklers

Ovehead Sprinkler Flow (gpm)	34.2
InRack Sprinkler Flow (gpm)	0
Other (custom defined) Sprinkler Flow (gpm)	0
Total Sprinkler Flow (gpm)	34.2

Other

Required Margin of Safety (%)	10
W1 - Pressure (psi)	65.7
W1 - Flow (gpm)	39.2
Demand w/o System Pump(s)	N/A

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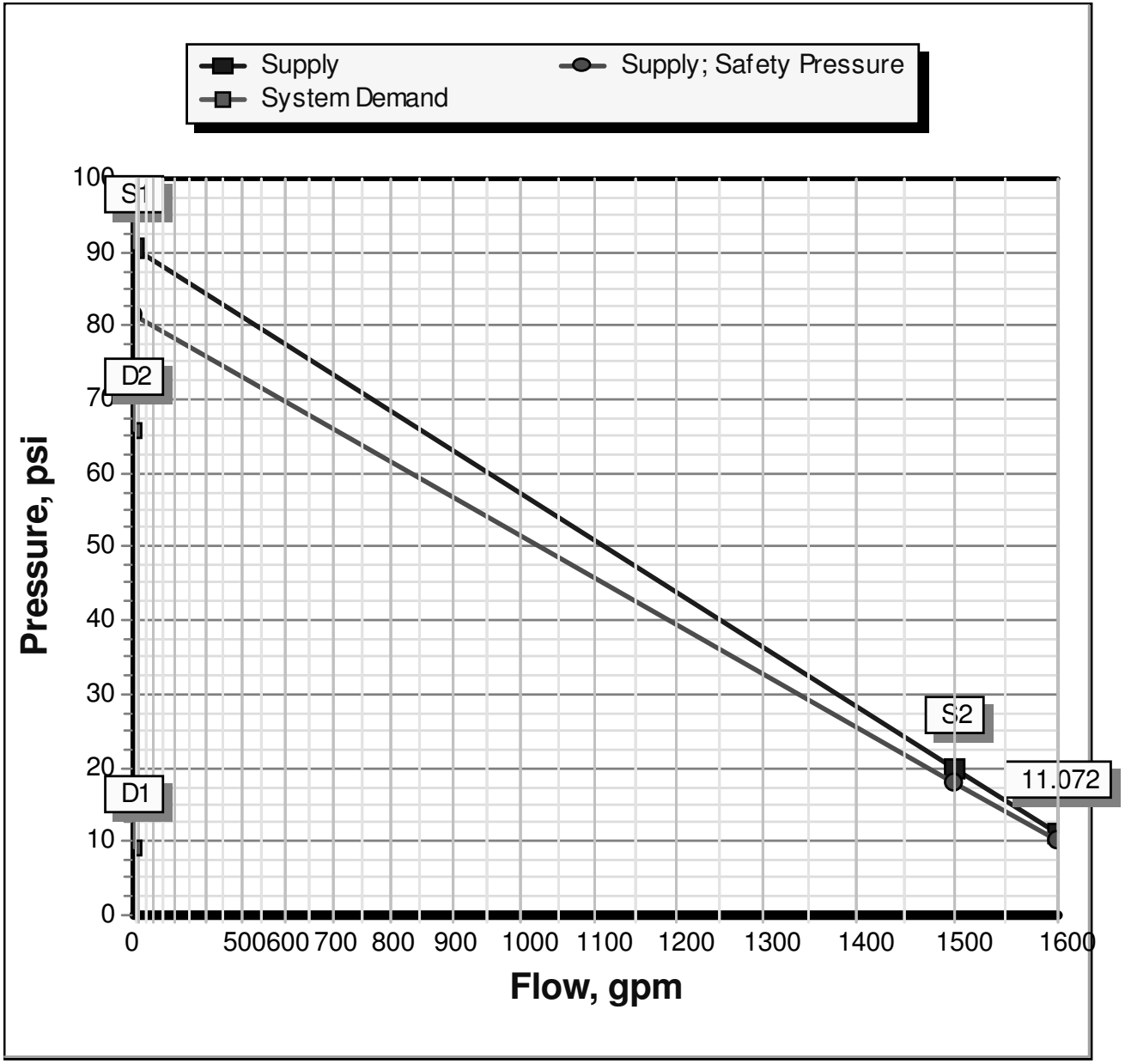
Hydraulic Analysis for : 2



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Hydraulic Analysis for : 2

Graph Labels

Label	Description	Values	
		Flow (gpm)	Pressure (psi)
S1	Supply point #1 - Static	0	90.4
S2	Supply point #2 - Residual	1500	20
D1	Elevation Pressure	0	9
D2	System Demand	39.2	65.7

Curve Intersections & Safety Margins

Curve Name	Intersection		Safety Margin	
	Pressure (psi)	Flow (gpm)	Pressure (psi)	@ Flow (gpm)
Supply	90.3	47.6	24.6	39.2
Supply; Safety Pressure	81.3	44.7	15.6	39.2

Open Heads

Head Ref.	Head Type	Coverage	K-Factor	Required			Calculated		
				Density	Flow	Pressure	Density	Flow	Pressure
		(ft²)	(gpm/psi½)	(gpm/ft²)	(gpm)	(psi)	(gpm/ft²)	(gpm)	(psi)
201	Overhead Sprinkler	324	4.9	0.05	16.2	12	0.053	17.2	12.3
202	Overhead Sprinkler	324	4.9	0.05	16.2	12	0.052	17	12

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Node Data

Node# Type	Hgroup Fitting	K-Fact. Stat. Pres.	Elev Coverage	X Y
		gpm/psi½ psi	ft ft²	ft ft
202 Overhead Sprinkler	HEAD	4.9 0	29.88 324	-190.11 529.02
201 Overhead Sprinkler	HEAD	4.9 0	29.88 324	-200.11 529.02
004 Node	NODE BM.Tee	0	30.36	-198.51 529.02
025 Node	NODE BM.Tee	0	8.75	-220.54 519.43
029 Node	NODE coupling	0	8.75	-212.82 510.02
031 Node	NODE coupling	0	7.08	-211.82 510.02
032-O Node	NODE coupling	0	6.51	-211.82 510.02
032-I Node	NODE coupling	0	4.9	-211.82 510.02
033 Node	NODE bigstd90	0	3	-211.82 510.02
D4 Inside Hose	HOSE	0	3	-206.64 509.52
034 Node	NODE BM.Tee	0	3	-206.64 510.02
037-O Node	NODE coupling	0	3	-237.69 558.98
W1 Supply	SUPPLY	0	9	-236.41 609.55
037-I Node	NODE coupling	0	3.01	-237.69 559.09

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Pipe Data

Pipe Ref.	Type	Start	End	Size	HWC	Length	Fittings	Eq.Len.	Total Len.	Schedule	Velocity
						ft		ft	ft		ft/s
198	Brline	004	202	1	150	8.89	1(BM.Tee-Br);1(BM.90);	10	18.89	CPVC	5.72
016	Cmain	025	004	1	150	90.93	7(BM.Tee-Run);5(BM.90);3(BM.Tee-Br);	47	137.93	CPVC	11.52
019	Cmain	029	025	1.25	150	17.14	1(coupling);1(BM.Tee-Run);1(BM.90);	7	24.14	CPVC	7.18
021	Cmain	031	029	1.25	120	2.67	1(coupling);1(bigstd90);	3	5.67	40	7.33
022	Cmain	032-O	031	1.25	150	0.56	1(coupling);			CPVC	7.18
263	BFP	032-I	032-O	1.25	0	1.61				WILKINS 350	0
023	Cmain	033	032-I	1.25	120	1.9	1(bigstd90);	3	4.9	40	7.33
024	Cmain	034	033	1.5	150	5.18	1(BM.Tee-Br);	8	13.18	CPVC	5.47
028	Cmain	037-O	034	1.5	150	79.97	1(coupling);2(BM.90);	16	95.97	CPVC	6.27
264	VALVE	037-I	037-O	1	0	0.1				Sensus Meter	0
030	Cmain	W1	037-I	1.5	150	52.14	1(BM.Tee-Run);1(BM.90);	8	60.14	CPVC	6.27
001	Brline	004	201	1	150	2.09	1(BM.Tee-Br);1(BM.90);	10	12.09	CPVC	5.8
025	Cmain	034	D4	1.5	150	0.5	1(BM.Tee-Run);	1	1.5	CPVC	0.8

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PIPE INFORMATION

Node 1 Node 2	Elev 1 Elev 2	K-Factor 1 K-Factor 2	Flow added(q)* Total flow (Q)	Nominal ID Actual ID	Fittings quantity x (name) = length	L F T	C Factor Pf per ft	total (Pt) elev (Pe) frict (Pf)	NOTES
	(ft)	(gpm/psi½)	(gpm)	(in)	(ft)	(ft)	(psi)	(psi)	
202 004	29.88 30.36	4.9	17 17	1 1.101	1x(BM.Tee-Br)=5 1x(BM.90)=5	8.89 10 18.89	150 0.05	12 -0.2 0.9	
004 025	30.36 8.75		17.2 34.2	1 1.101	7x(BM.Tee-Run)=7 5x(BM.90)=25 3x(BM.Tee-Br)=15	90.93 47 137.93	150 0.1828	12.7 9.4 25.2	
025 029	8.75 8.75		0 34.2	1.25 1.394	1x(BM.Tee-Run)=1 1x(BM.90)=6	17.14 7 24.14	150 0.0579	47.3 0 1.4	
029 031	8.75 7.08		0 34.2	1.25 1.38	1x(bigstd90)=3	2.67 3 5.67	120 0.092	48.7 0.7 0.5	
031 032-O	7.08 6.51		0 34.2	1.25 1.394		0.56 0 0.56	150 0.0579	50 0.2 0.0	
032-O 032-I	6.51 4.9		0 34.2	1.25 0		1.61 0 1.61	0 3.0733	50.2 0.7 5	WILKINS 350
032-I 033	4.9 3		0 34.2	1.25 1.38	1x(bigstd90)=3	1.9 3 4.9	120 0.092	55.9 0.8 0.5	
033 034	3 3		0 34.2	1.5 1.598	1x(BM.Tee-Br)=8	5.18 8 13.18	150 0.0298	57.2 0 0.4	
034 037-O	3 3		5 39.2	1.5 1.598	2x(BM.90)=16	79.97 16 95.97	150 0.0384	57.6 0 3.7	
037-O 037-I	3 3.01		0 39.2	1 0		0.1 0 0.1	0 45.0585	61.2 0 4.7	Sensus Meter
037-I W1	3.01 9		0 39.2	1.5 1.598	1x(BM.Tee-Run)=1 1x(BM.90)=8	52.14 8 60.14	150 0.0384	66 -2.6 2.3	
201 004	29.88 30.36	4.9	17.2 17.2	1 1.101	1x(BM.Tee-Br)=5 1x(BM.90)=5	2.09 10 12.09	150 0.0513	12.3 -0.2 0.6	
D4 034	3 3		5 5	1.5 1.598	1x(BM.Tee-Run)=1	0.5 1 1.5	150 0.0008	57.6 0 0	

* Discharge shown for flowing nodes only

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PIPE INFORMATION

Node 1 Node 2	Elev 1 Elev 2	K-Factor 1 K-Factor 2	Flow added (q) Total flow (Q)	Nominal ID Actual ID	Fittings quantity x (name) = length	L F T	C Factor Pf per ft	total (Pt) elev (Pe) frict (Pf)	NOTES
	(ft)	(gpm/psi½)	(gpm)	(in)	(ft)	(ft)	(psi)	(psi)	

Path No: 1

202	29.88	4.9	17	1	1x(BM.Tee-Br)=5	8.89	150	12	
004	30.36		17	1.101	1x(BM.90)=5	10	0.05	-0.2	
						18.89		0.9	
004	30.36		17.2	1	7x(BM.Tee-Run)=7	90.93	150	12.7	
025	8.75		34.2	1.101	5x(BM.90)=25	47	0.1828	9.4	
					3x(BM.Tee-Br)=15	137.93		25.2	
025	8.75		0	1.25	1x(BM.Tee-Run)=1	17.14	150	47.3	
029	8.75		34.2	1.394	1x(BM.90)=6	7	0.0579	0	
						24.14		1.4	
029	8.75		0	1.25	1x(bigstd90)=3	2.67	120	48.7	
031	7.08		34.2	1.38		3	0.092	0.7	
						5.67		0.5	
031	7.08		0	1.25		0.56	150	50	
032-O	6.51		34.2	1.394		0	0.0579	0.2	
						0.56		0.0	
032-O	6.51		0	1.25		1.61	0	50.2	WILKINS 350
032-I	4.9		34.2	0		0	3.0733	0.7	
						1.61		5	
032-I	4.9		0	1.25	1x(bigstd90)=3	1.9	120	55.9	
033	3		34.2	1.38		3	0.092	0.8	
						4.9		0.5	
033	3		0	1.5	1x(BM.Tee-Br)=8	5.18	150	57.2	
034	3		34.2	1.598		8	0.0298	0	
						13.18		0.4	
034	3		5	1.5	2x(BM.90)=16	79.97	150	57.6	
037-O	3		39.2	1.598		16	0.0384	0	
						95.97		3.7	
037-O	3		0	1		0.1	0	61.2	Sensus Meter
037-I	3.01		39.2	0		0	45.0585	0	
						0.1		4.7	
037-I	3.01		0	1.5	1x(BM.Tee-Run)=1	52.14	150	66	
W1	9		39.2	1.598	1x(BM.90)=8	8	0.0384	-2.6	
						60.14		2.3	
W1								**65.7**	

Path No: 2

201	29.88	4.9	17.2	1	1x(BM.Tee-Br)=5	2.09	150	12.3	
004	30.36		17.2	1.101	1x(BM.90)=5	10	0.0513	-0.2	
						12.09		0.6	
004								**12.7**	

Path No: 3

D4	3		5	1.5	1x(BM.Tee-Run)=1	0.5	150	57.6	
034	3		5	1.598		1	0.0008	0	
						1.5		0	
034								**57.6**	

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PIPE INFORMATION

Node 1 Node 2	Elev 1 Elev 2	K-Factor 1 K-Factor 2	Flow added (q) Total flow (Q)	Nominal ID Actual ID	Fittings quantity x (name) = length	L F T	C Factor Pf per ft	total (Pt) elev (Pe) frict (Pf)	NOTES
	(ft)	(gpm/psi½)	(gpm)	(in)	(ft)	(ft)	(psi)	(psi)	

* Pressures are balanced to a high degree of accuracy. Values may vary by 0.1 psi due to display rounding.

* Maximum Velocity of 11.52 ft/s occurs in the following pipe(s): (025-004)

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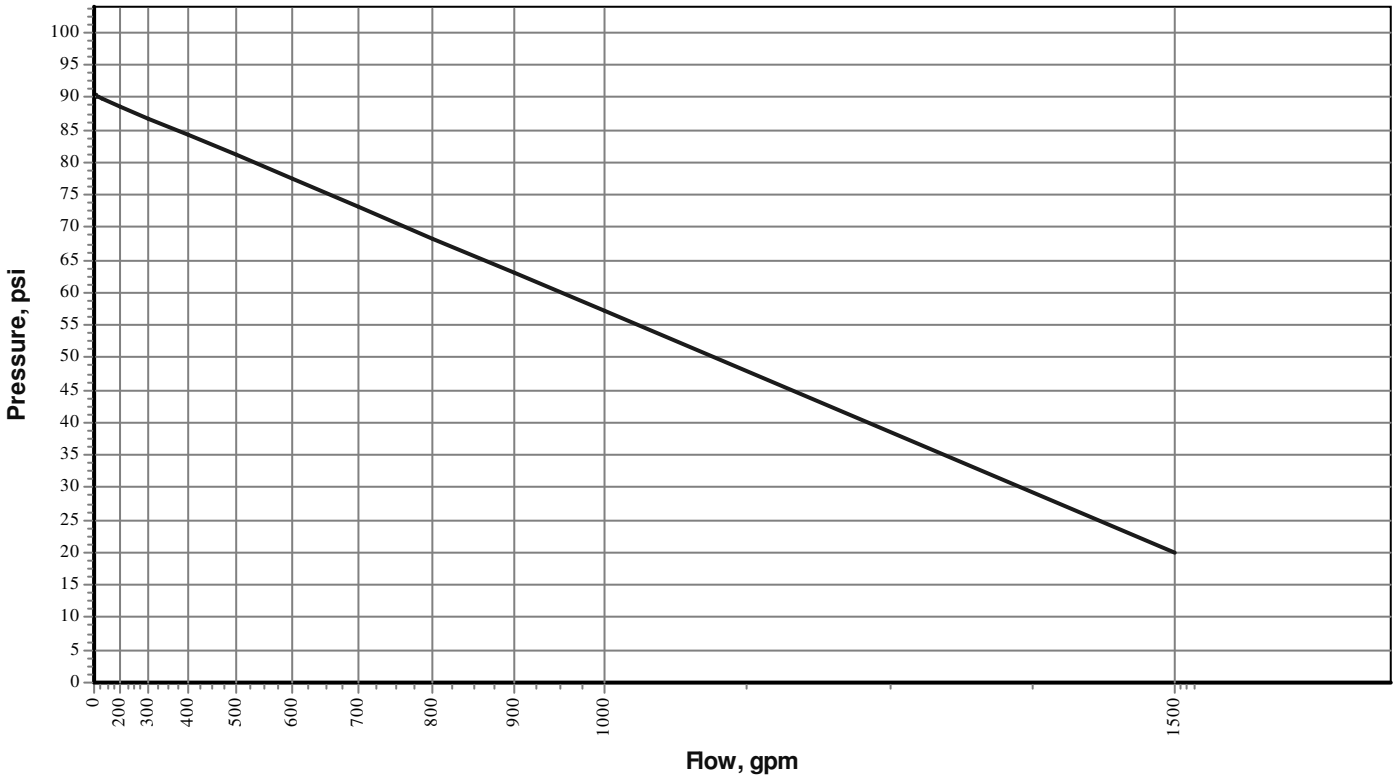
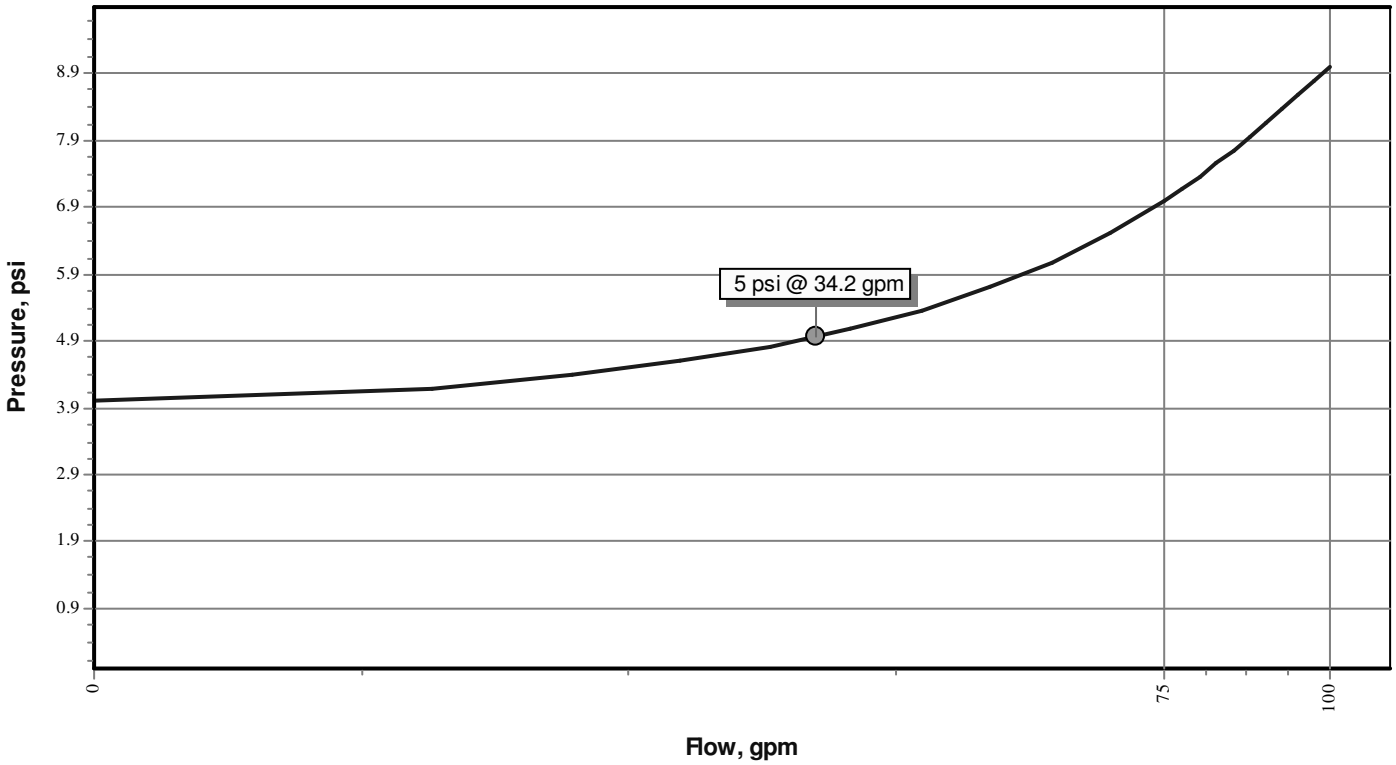
Pressure vs. Flow Function
Design Area: 2; Supply Ref.: W1; Supply Name:W1



Pressure Loss Function
Design Area: 2; BFP Ref.: 263 (WILKINS 350, Size = 1.25)



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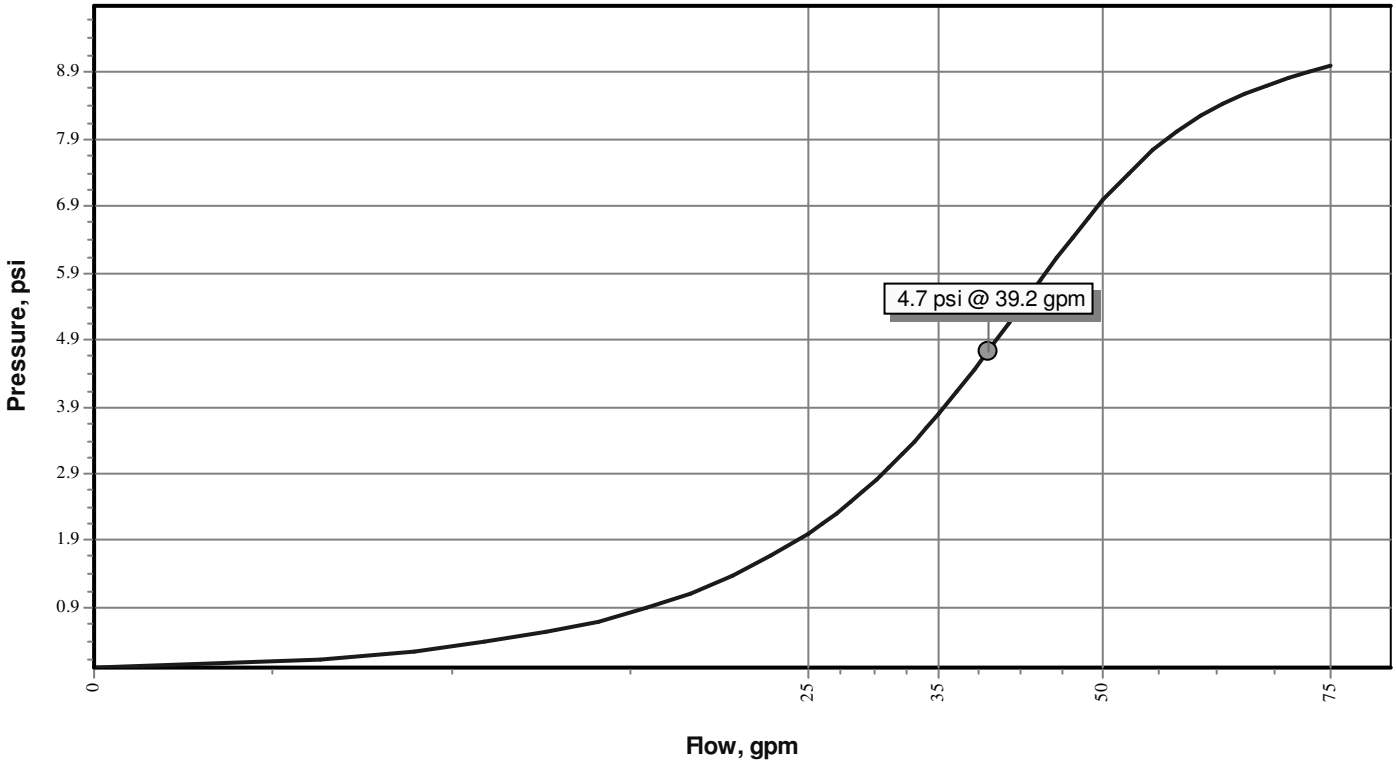
Pressure Loss Function
Design Area: 2; Valve Ref.: 264 (Sensus Meter, Size = 1)



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CALCULATION SUMMARY

Project Name : KIRKLAND TOWNHOMES

Drawing No. :

Project Location: 10143 64TH STREET

City: KIRKLAND, WA

DOMESTIC
ALLOWANCE
PRE NFPA 13D

Design Areas

Design Area Name	Calc. Mode (Model)	Occupancy	Area of Application	Total Water	Pressure @ Source	Min. Density	Min. Pressure	Min. Flow	Calculated Heads	Hose Streams	Margin To Source
			(ft²)	(gpm)	(psi)	(gpm/ft²)	(psi)	(gpm)	#	(gpm)	(psi)
3	Demand (HW)	GARAGE	640	69.6	90.2	0.1	32.7	32	2	5	10.5

WASHINGTON STATE
CERTIFICATE OF COMPETENCY
FIRE PROTECTION SPRINKLER SYSTEMS

David Yates
2605-0898-C
BFPS, L. L. C.
BFPSLL *929MA

Level 3

Signature

Expires 12/31/15

7/3/15
Date

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HYDRAULIC CALCULATIONS
for

Job Information

Project Name : KIRKLAND TOWNHOMES

Contract No. :

City: KIRKLAND, WA

Project Location: 10143 64TH STREET

Date: 6/26/2015

Contractor Information

Name of Contractor: BURNS FIRE PROTECTION SYSTEMS

Address: P.O.B. 11021

City: GRANITE FALLS, WA

Phone Number: 425-388-0124

E-mail:

Name of Designer: D.YATES

Authority Having Jurisdiction: CITY OF KIRKLAND

Design

Remote Area Name	3
Remote Area Location	GARAGE SOUTH
Occupancy Classification	GARAGE
Density (gpm/ft²)	0.1
Area of Application (ft²)	640
Coverage per Sprinkler (ft²)	320
Number of Calculated Sprinklers	2
In-Rack Demand (gpm)	0
Special Heads	
Hose Streams (gpm)	5
Total Water Required (incl. Hose Streams) (gpm)	69.6
Required Pressure at Source (psi)	79.7
Type of System	Wet
Volume - Entire System (gal)	20.2 gal

Water Supply Information

Date	7/2/15
Location	HYDRANT ON N.E. 64TH ST.
Source	W1

Notes

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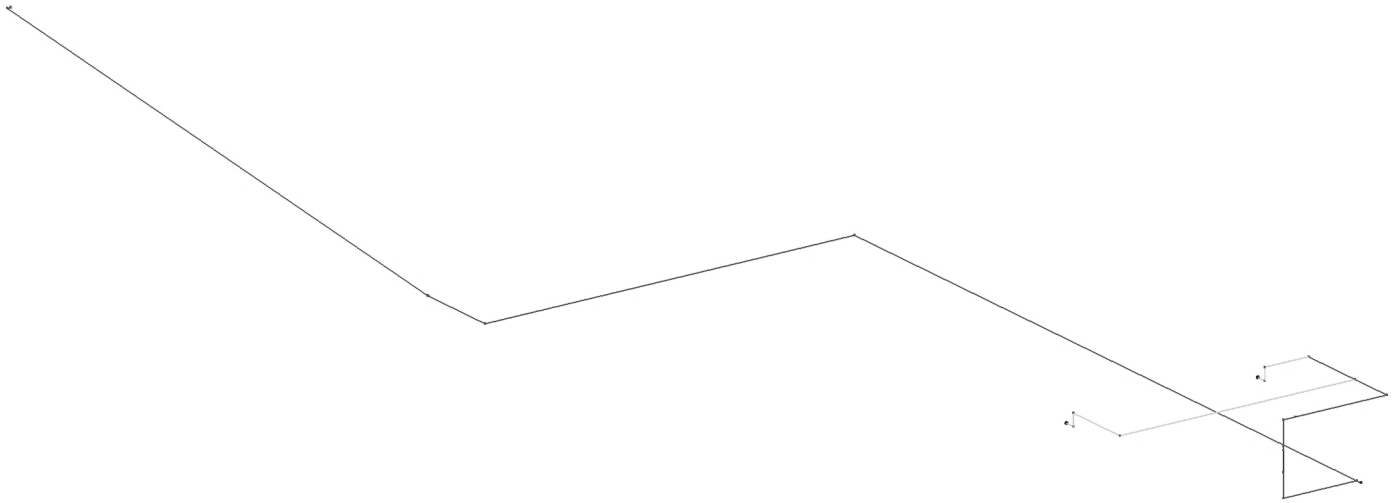
Node Labels: Off
Pipe Labels: Off

Diagram for Design Area : 3
(Optimized Hydraulic Simplified)



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Hydraulic Analysis for : 3

Calculation Info

Calculation Mode	Demand
Hydraulic Model	Hazen-Williams
Fluid Name	Water @ 60F (15.6C)
Fluid Weight, (lb/ft³)	N/A for Hazen-Williams calculation.
Fluid Dynamic Viscosity, (lb·s/ft²)	N/A for Hazen-Williams calculation.

Water Supply Parameters

Supply 1 : W1

Flow (gpm)	Pressure (psi)
0	90.4
1500	20

Hoses

Inside Hose Flow / Standpipe Demand (gpm)	5
Outside Hose Flow (gpm)	0
Additional Outside Hose Flow (gpm)	
Other (custom defined) Hose Flow (gpm)	0
Total Hose Flow (gpm)	5

Sprinklers

Ovehead Sprinkler Flow (gpm)	64.6
InRack Sprinkler Flow (gpm)	0
Other (custom defined) Sprinkler Flow (gpm)	0
Total Sprinkler Flow (gpm)	64.6

Other

Required Margin of Safety (%)	10
W1 - Pressure (psi)	79.7
W1 - Flow (gpm)	69.6
Demand w/o System Pump(s)	N/A

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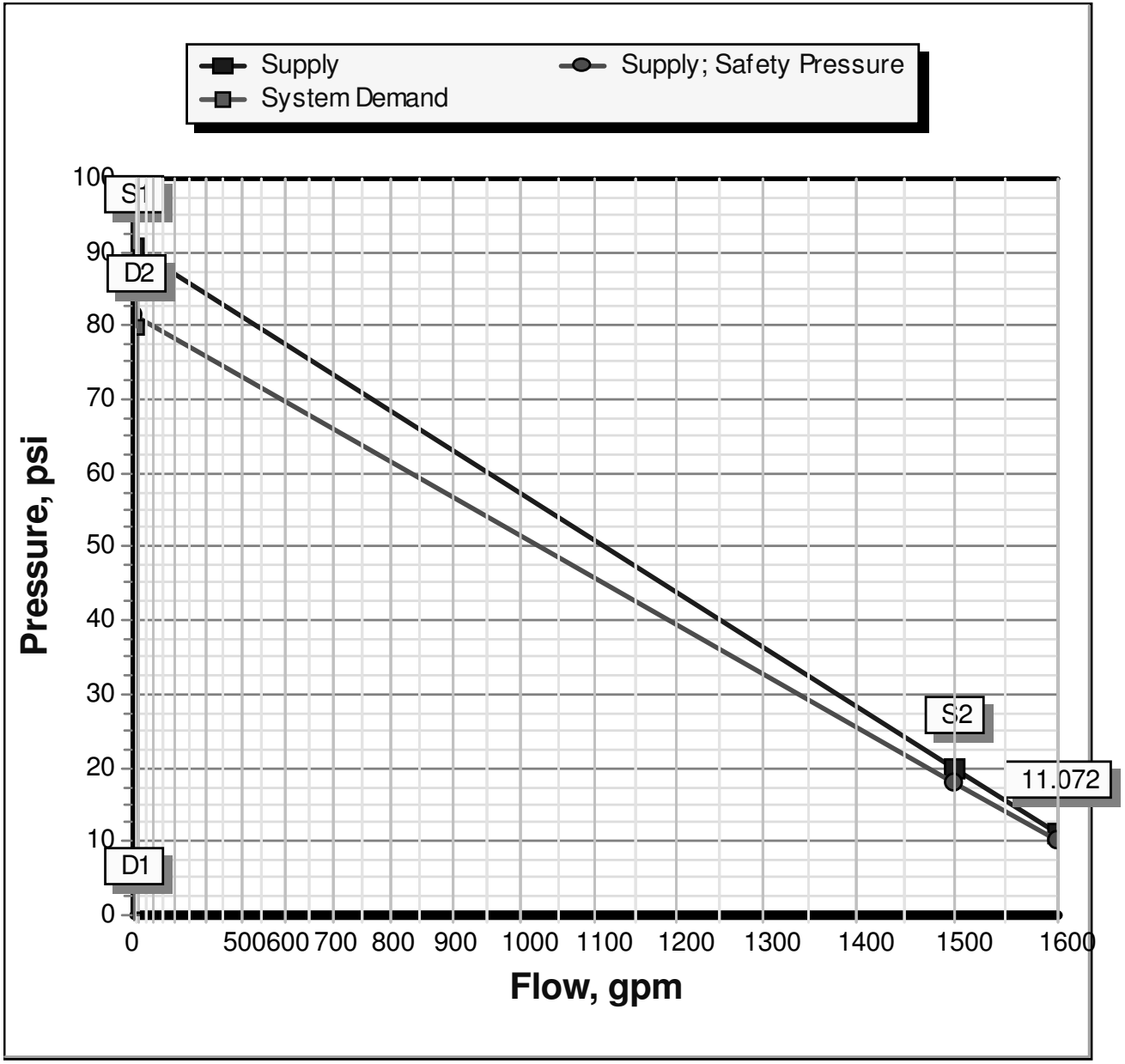
Hydraulic Analysis for : 3



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Hydraulic Analysis for : 3

Graph Labels

Label	Description	Values	
		Flow (gpm)	Pressure (psi)
S1	Supply point #1 - Static	0	90.4
S2	Supply point #2 - Residual	1500	20
D1	Elevation Pressure	0	-0.5
D2	System Demand	69.6	79.7

Curve Intersections & Safety Margins

Curve Name	Intersection		Safety Margin	
	Pressure (psi)	Flow (gpm)	Pressure (psi)	@ Flow (gpm)
Supply	90.1	74.4	10.5	69.6
Supply; Safety Pressure	81.1	70.3	1.5	69.6

Open Heads

Head Ref.	Head Type	Coverage	K-Factor	Required			Calculated		
				Density	Flow	Pressure	Density	Flow	Pressure
		(ft²)	(gpm/psi½)	(gpm/ft²)	(gpm)	(psi)	(gpm/ft²)	(gpm)	(psi)
301	Overhead Sprinkler	320	5.6	0.1	32	32.7	0.1	32	32.7
302	Overhead Sprinkler	320	5.6	0.1	32	32.7	0.102	32.6	34

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Node Data

Node# Type	Hgroup Fitting	K-Fact. Stat. Pres.	Elev Coverage	X Y
		gpm/psi½ psi	ft ft²	ft ft
301 Overhead Sprinkler	HEAD	5.6 0	7.75 320	-222.87 502.08
302 Overhead Sprinkler	HEAD	5.6 0	7.75 320	-206.78 502.08
007 Node	NODE BM.Tee	0	8.75	-222.87 495.67
130 Node	NODE BM.Tee	0	8.75	-203.1 501.25
018 Node	NODE BM.Tee	0	8.75	-203.1 495.67
020 Node	NODE coupling	0	8.75	-210.82 491.84
022 Node	NODE coupling	0	6.82	-211.82 491.84
023-O Node	NODE coupling	0	6.51	-211.82 491.84
023-I Node	NODE coupling	0	4.9	-211.82 491.84
024 Node	NODE BM.90	0	3	-211.82 491.84
D3 Inside Hose	HOSE	0	3	-205.64 491.34
001 Node	NODE BM.Tee	0	3	-205.64 491.84
028-O Node	NODE coupling	0	3	-236.69 558.98
028-I Node	NODE coupling	0	3.01	-236.69 559.09
W1 Supply	SUPPLY	0	9	-236.41 609.55

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Pipe Data

Pipe Ref.	Type	Start	End	Size	HWC	Length	Fittings	Eq.Len.	Total Len.	Schedule	Velocity
						ft		ft	ft		ft/s
024	Brline	007	301	1	150	7.42	1(BM.Tee-Br);2(BM.90);	15	22.42	CPVC	10.78
009	Brline	018	007	1.25	150	19.77	3(BM.Tee-Run);1(BM.Tee-Br);	9	28.77	CPVC	6.73
007	Cmain	020	018	1.25	150	11.55	1(coupling);1(BM.90);	6	17.55	CPVC	13.59
005	Cmain	022	020	1.25	120	2.93	1(coupling);1(bigstd90);	3	5.93	40	13.86
004	Cmain	023-O	022	1.25	150	0.3	1(coupling);			CPVC	13.59
263	BFP	023-I	023-O	1.25	0	1.61				WILKINS 350	0
003	Cmain	024	023-I	1.25	150	1.9	1(BM.90);	6	7.9	CPVC	13.59
002	Cmain	001	024	1.5	150	6.18	1(BM.Tee-Br);	8	14.18	CPVC	10.34
097	Cmain	028-O	001	1.5	150	98.15	1(coupling);2(BM.90);	16	114.15	CPVC	11.14
264	VALVE	028-I	028-O	1	0	0.1				Sensus Meter	0
198	Cmain	W1	028-I	1.5	150	51.14	1(BM.Tee-Br);	8	59.14	CPVC	11.14
028	Brline	130	302	1	150	5.51	1(BM.Tee-Br);2(BM.90);	15	20.51	CPVC	11
027	Cmain	018	130	1.25	150	5.58	1(BM.Tee-Run);	1	6.58	CPVC	6.86
001	Cmain	001	D3	1.5	150	0.5	1(BM.Tee-Run);	1	1.5	CPVC	0.8

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PIPE INFORMATION

Node 1 Node 2	Elev 1 Elev 2	K-Factor 1 K-Factor 2	Flow added(q)* Total flow (Q)	Nominal ID Actual ID	Fittings quantity x (name) = length	L F T	C Factor Pf per ft	total (Pt) elev (Pe) frict (Pf)	NOTES
	(ft)	(gpm/psi½)	(gpm)	(in)	(ft)	(ft)	(psi)	(psi)	
301 007	7.75 8.75	5.6	32 32	1 1.101	1x(BM.Tee-Br)=5 2x(BM.90)=10	7.42 15 22.42	150 0.1618	32.7 -0.4 3.6	
007 018	8.75 8.75		0 32	1.25 1.394	3x(BM.Tee-Run)=3 1x(BM.Tee-Br)=6	19.77 9 28.77	150 0.0513	35.8 0 1.5	
018 020	8.75 8.75		32.6 64.6	1.25 1.394	1x(BM.90)=6	11.55 6 17.55	150 0.1886	37.3 0 3.3	
020 022	8.75 6.82		0 64.6	1.25 1.38	1x(bigstd90)=3	2.93 3 5.93	120 0.2994	40.6 0.8 1.8	
022 023-O	6.82 6.51		0 64.6	1.25 1.394		0.3 0 0.3	150 0.1886	43.2 0.1 0.1	
023-O 023-I	6.51 4.9		0 64.6	1.25 0		1.61 0 1.61	0 3.9252	43.4 0.7 6.3	WILKINS 350
023-I 024	4.9 3		0 64.6	1.25 1.394	1x(BM.90)=6	1.9 6 7.9	150 0.1886	50.5 0.8 1.5	
024 001	3 3		0 64.6	1.5 1.598	1x(BM.Tee-Br)=8	6.18 8 14.18	150 0.097	52.8 0 1.4	
001 028-O	3 3		5 69.6	1.5 1.598	2x(BM.90)=16	98.15 16 114.15	150 0.1113	54.2 0 12.7	
028-O 028-I	3 3.01		0 69.6	1 0		0.1 0 0.1	0 84.0245	66.9 0 8.8	Sensus Meter
028-I W1	3.01 9		0 69.6	1.5 1.598	1x(BM.Tee-Br)=8	51.14 8 59.14	150 0.1113	75.7 -2.6 6.6	
302 130	7.75 8.75	5.6	32.6 32.6	1 1.101	1x(BM.Tee-Br)=5 2x(BM.90)=10	5.51 15 20.51	150 0.1678	34 -0.4 3.4	
130 018	8.75 8.75		0 32.6	1.25 1.394	1x(BM.Tee-Run)=1	5.58 1 6.58	150 0.0532	37 0 0.4	
D3 001	3 3		5 5	1.5 1.598	1x(BM.Tee-Run)=1	0.5 1 1.5	150 0.0008	54.2 0 0	

* Discharge shown for flowing nodes only

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PIPE INFORMATION

Node 1 Node 2	Elev 1 Elev 2	K-Factor 1 K-Factor 2	Flow added (q) Total flow (Q)	Nominal ID Actual ID	Fittings quantity x (name) = length	L F T	C Factor Pf per ft	total (Pt) elev (Pe) frict (Pf)	NOTES
	(ft)	(gpm/psi½)	(gpm)	(in)	(ft)	(ft)	(psi)	(psi)	
Path No: 1									
301	7.75	5.6	32	1	1x(BM.Tee-Br)=5	7.42	150	32.7	
007	8.75		32	1.101	2x(BM.90)=10	15	0.1618	-0.4	
						22.42		3.6	
007	8.75		0	1.25	3x(BM.Tee-Run)=3	19.77	150	35.8	
018	8.75		32	1.394	1x(BM.Tee-Br)=6	9	0.0513	0	
						28.77		1.5	
018	8.75		32.6	1.25	1x(BM.90)=6	11.55	150	37.3	
020	8.75		64.6	1.394		6	0.1886	0	
						17.55		3.3	
020	8.75		0	1.25	1x(bigstd90)=3	2.93	120	40.6	
022	6.82		64.6	1.38		3	0.2994	0.8	
						5.93		1.8	
022	6.82		0	1.25		0.3	150	43.2	
023-O	6.51		64.6	1.394		0	0.1886	0.1	
						0.3		0.1	
023-O	6.51		0	1.25		1.61	0	43.4	WILKINS 350
023-I	4.9		64.6	0		0	3.9252	0.7	
						1.61		6.3	
023-I	4.9		0	1.25	1x(BM.90)=6	1.9	150	50.5	
024	3		64.6	1.394		6	0.1886	0.8	
						7.9		1.5	
024	3		0	1.5	1x(BM.Tee-Br)=8	6.18	150	52.8	
001	3		64.6	1.598		8	0.097	0	
						14.18		1.4	
001	3		5	1.5	2x(BM.90)=16	98.15	150	54.2	
028-O	3		69.6	1.598		16	0.1113	0	
						114.15		12.7	
028-O	3		0	1		0.1	0	66.9	Sensus Meter
028-I	3.01		69.6	0		0	84.0245	0	
						0.1		8.8	
028-I	3.01		0	1.5	1x(BM.Tee-Br)=8	51.14	150	75.7	
W1	9		69.6	1.598		8	0.1113	-2.6	
						59.14		6.6	
W1								**79.7**	
Path No: 2									
302	7.75	5.6	32.6	1	1x(BM.Tee-Br)=5	5.51	150	34	
130	8.75		32.6	1.101	2x(BM.90)=10	15	0.1678	-0.4	
						20.51		3.4	
130	8.75		0	1.25	1x(BM.Tee-Run)=1	5.58	150	37	
018	8.75		32.6	1.394		1	0.0532	0	
						6.58		0.4	
018								**37.3**	
Path No: 3									
D3	3		5	1.5	1x(BM.Tee-Run)=1	0.5	150	54.2	
001	3		5	1.598		1	0.0008	0	
						1.5		0	
001								**54.2**	

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PIPE INFORMATION

Node 1 Node 2	Elev 1 Elev 2	K-Factor 1 K-Factor 2	Flow added (q) Total flow (Q)	Nominal ID Actual ID	Fittings quantity x (name) = length	L F T	C Factor Pf per ft	total (Pt) elev (Pe) frict (Pf)	NOTES
	(ft)	(gpm/psi½)	(gpm)	(in)	(ft)	(ft)	(psi)	(psi)	

* Pressures are balanced to a high degree of accuracy. Values may vary by 0.1 psi due to display rounding.

* Maximum Velocity of 13.86 ft/s occurs in the following pipe(s): (022-020)

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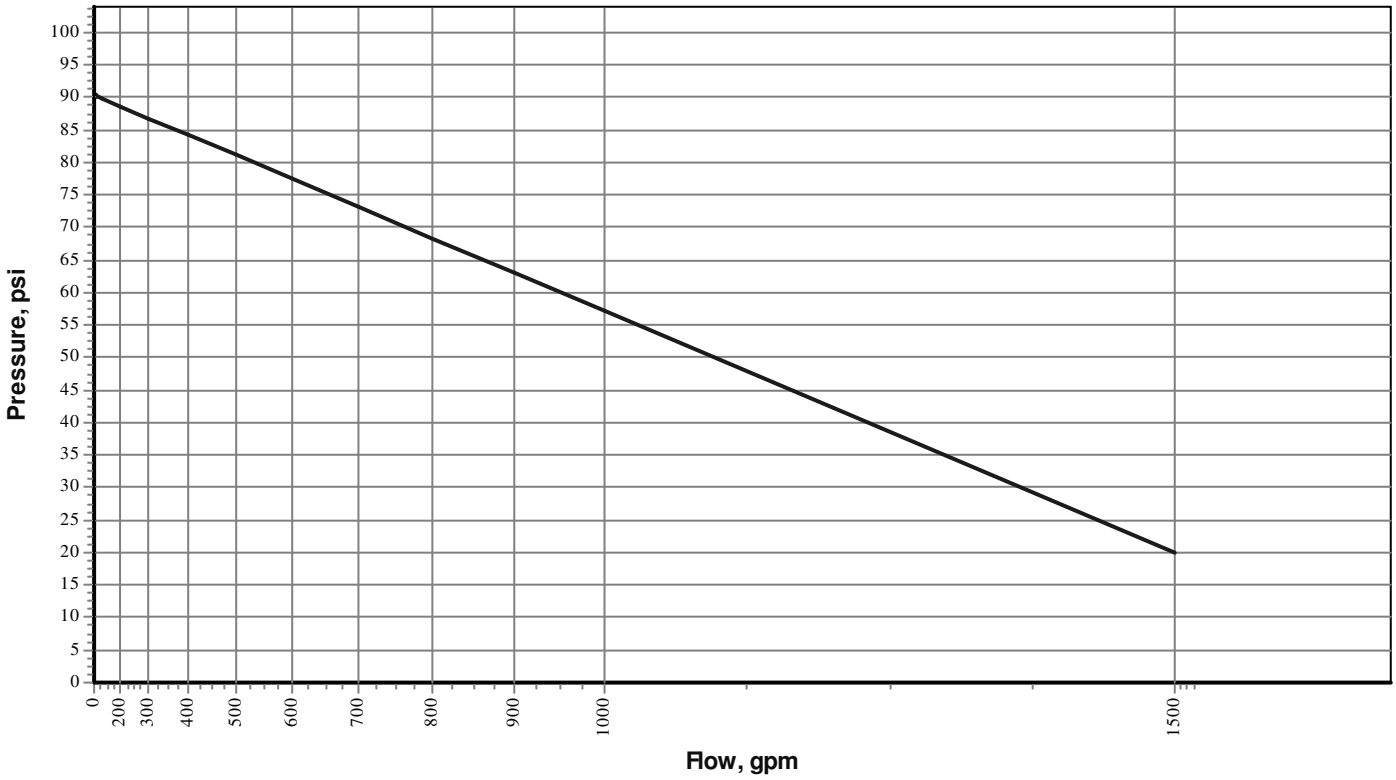
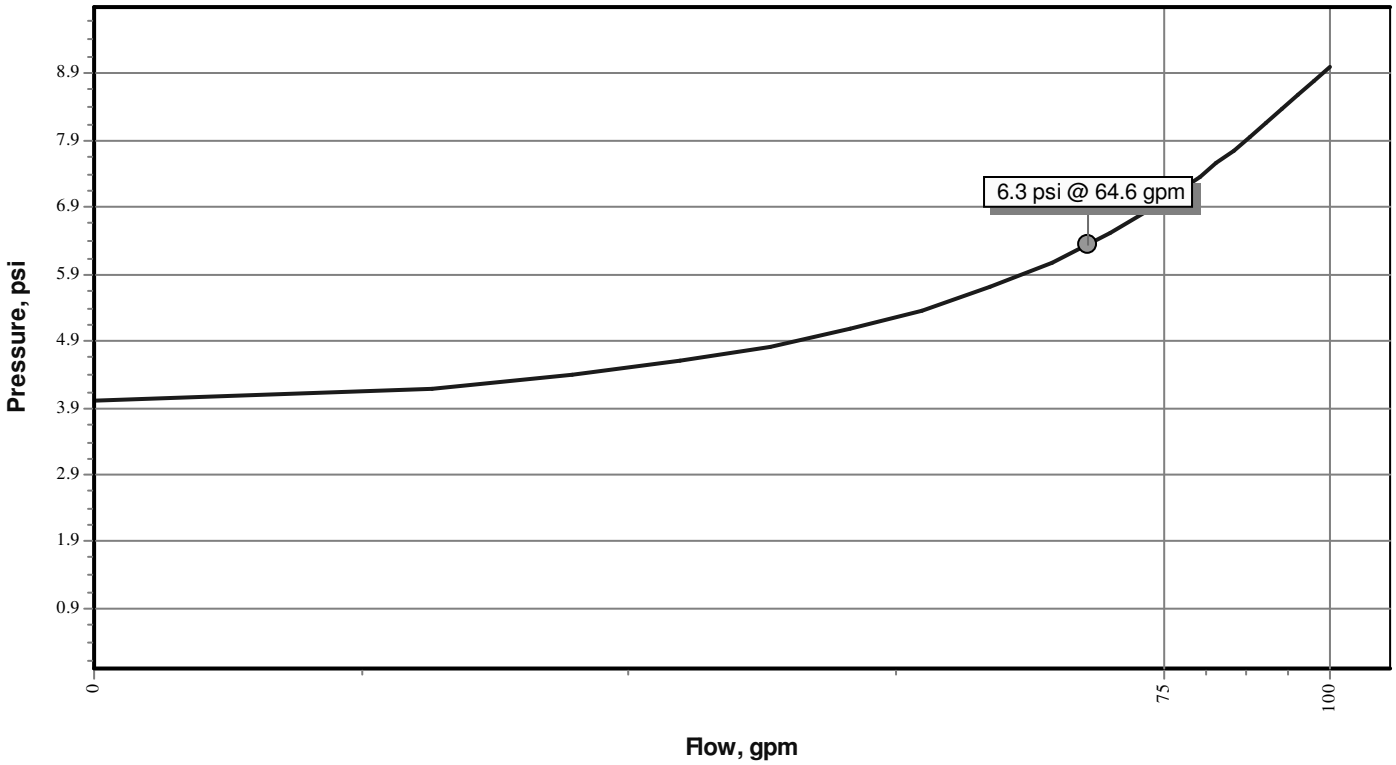
Pressure vs. Flow Function
Design Area: 3; Supply Ref.: W1; Supply Name:W1



Pressure Loss Function
Design Area: 3; BFP Ref.: 263 (WILKINS 350, Size = 1.25)



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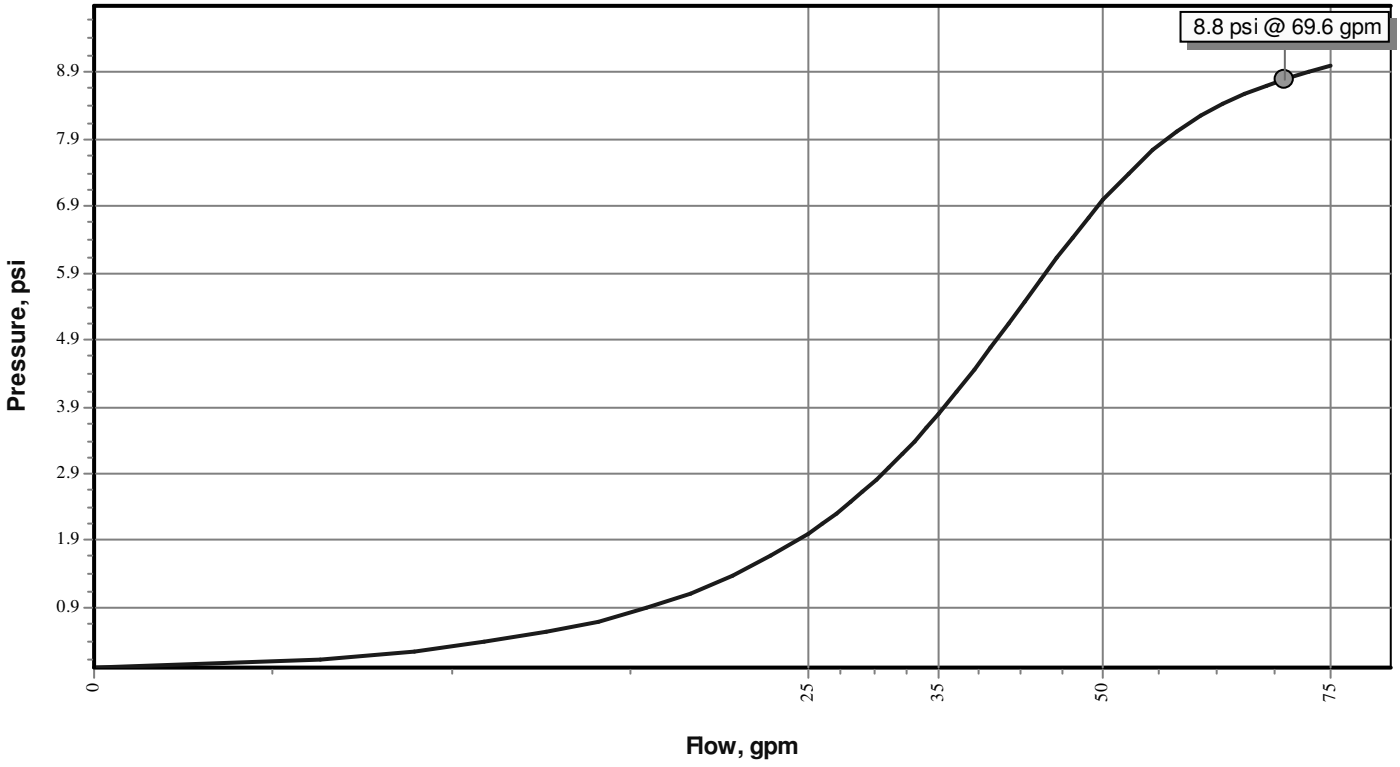
Pressure Loss Function
Design Area: 3; Valve Ref.: 264 (Sensus Meter, Size = 1)



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CALCULATION SUMMARY

Project Name : KIRKLAND TOWNHOMES

Project Location: 10143 64TH STREET

Drawing No. :

City: KIRKLAND, WA

DOMESTIC
ALLOWANCE
PER NFPA 13D

Design Areas

Design Area Name	Calc. Mode (Model)	Occupancy	Area of Application	Total Water	Pressure @ Source	Min. Density	Min. Pressure	Min. Flow	Calculated Heads	Hose Streams	Margin To Source
			(ft²)	(gpm)	(psi)	(gpm/ft²)	(psi)	(gpm)	#	(gpm)	(psi)
4	Demand (HW)	GARAGE	640	69.6	90.2	0.1	32.7	32	2	5	12.5

WASHINGTON STATE
CERTIFICATE OF COMPETENCY
FIRE PROTECTION SPRINKLER SYSTEMS

David Yates
2605-0898-C Level 3
BFPS, L. L. C.
BFPSLL *928MA

Signature

Expires 12/31/15

7/3/15
Date

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HYDRAULIC CALCULATIONS
for

Job Information

Project Name : KIRKLAND TOWNHOMES

Contract No. :

City: KIRKLAND, WA

Project Location: 10143 64TH STREET

Date: 6/26/2015

Contractor Information

Name of Contractor: BURNS FIRE PROTECTION SYSTEMS

Address: P.O.B. 11021

City: GRANITE FALLS, WA

Phone Number: 425-388-0124

E-mail:

Name of Designer: D.YATES

Authority Having Jurisdiction: CITY OF KIRKLAND

Design

Remote Area Name	4
Remote Area Location	GARAGE NORTH
Occupancy Classification	GARAGE
Density (gpm/ft²)	0.1
Area of Application (ft²)	640
Coverage per Sprinkler (ft²)	320
Number of Calculated Sprinklers	2
In-Rack Demand (gpm)	0
Special Heads	
Hose Streams (gpm)	5
Total Water Required (incl. Hose Streams) (gpm)	69.6
Required Pressure at Source (psi)	77.6
Type of System	Wet
Volume - Entire System (gal)	18.3 gal

Water Supply Information

Date	7/2/15
Location	HYDRANT ON N.E. 64TH ST.
Source	W1

Notes

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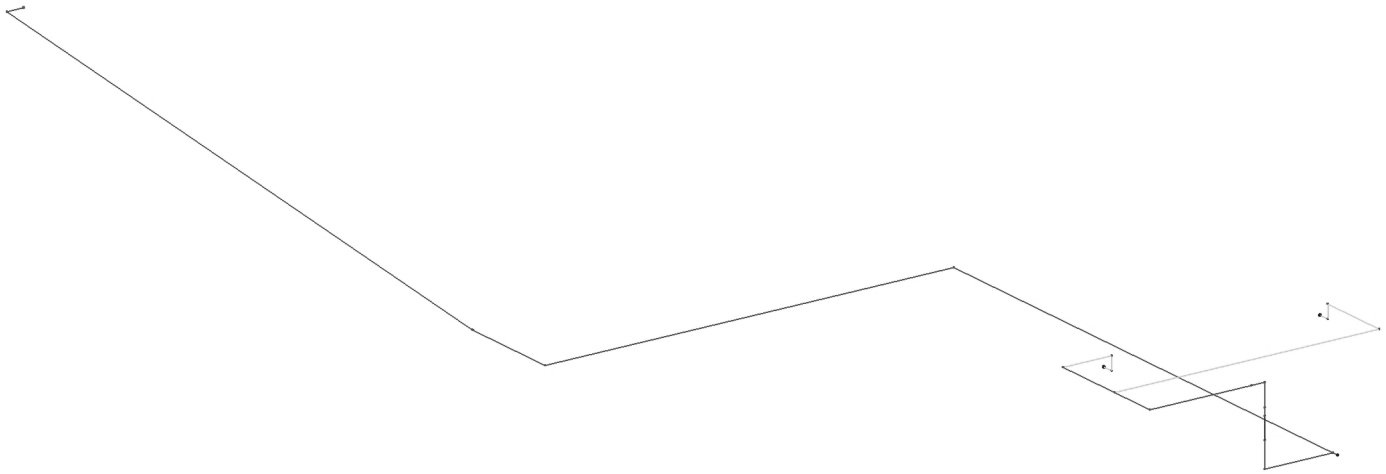
Node Labels: Off
Pipe Labels: Off

Diagram for Design Area : 4
(Optimized Hydraulic Simplified)



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Hydraulic Analysis for : 4

Calculation Info

Calculation Mode	Demand
Hydraulic Model	Hazen-Williams
Fluid Name	Water @ 60F (15.6C)
Fluid Weight, (lb/ft³)	N/A for Hazen-Williams calculation.
Fluid Dynamic Viscosity, (lb·s/ft²)	N/A for Hazen-Williams calculation.

Water Supply Parameters

Supply 1 : W1

Flow (gpm)	Pressure (psi)
0	90.4
1500	20

Hoses

Inside Hose Flow / Standpipe Demand (gpm)	5
Outside Hose Flow (gpm)	0
Additional Outside Hose Flow (gpm)	
Other (custom defined) Hose Flow (gpm)	0
Total Hose Flow (gpm)	5

Sprinklers

Ovehead Sprinkler Flow (gpm)	64.6
InRack Sprinkler Flow (gpm)	0
Other (custom defined) Sprinkler Flow (gpm)	0
Total Sprinkler Flow (gpm)	64.6

Other

Required Margin of Safety (%)	10
W1 - Pressure (psi)	77.6
W1 - Flow (gpm)	69.6
Demand w/o System Pump(s)	N/A

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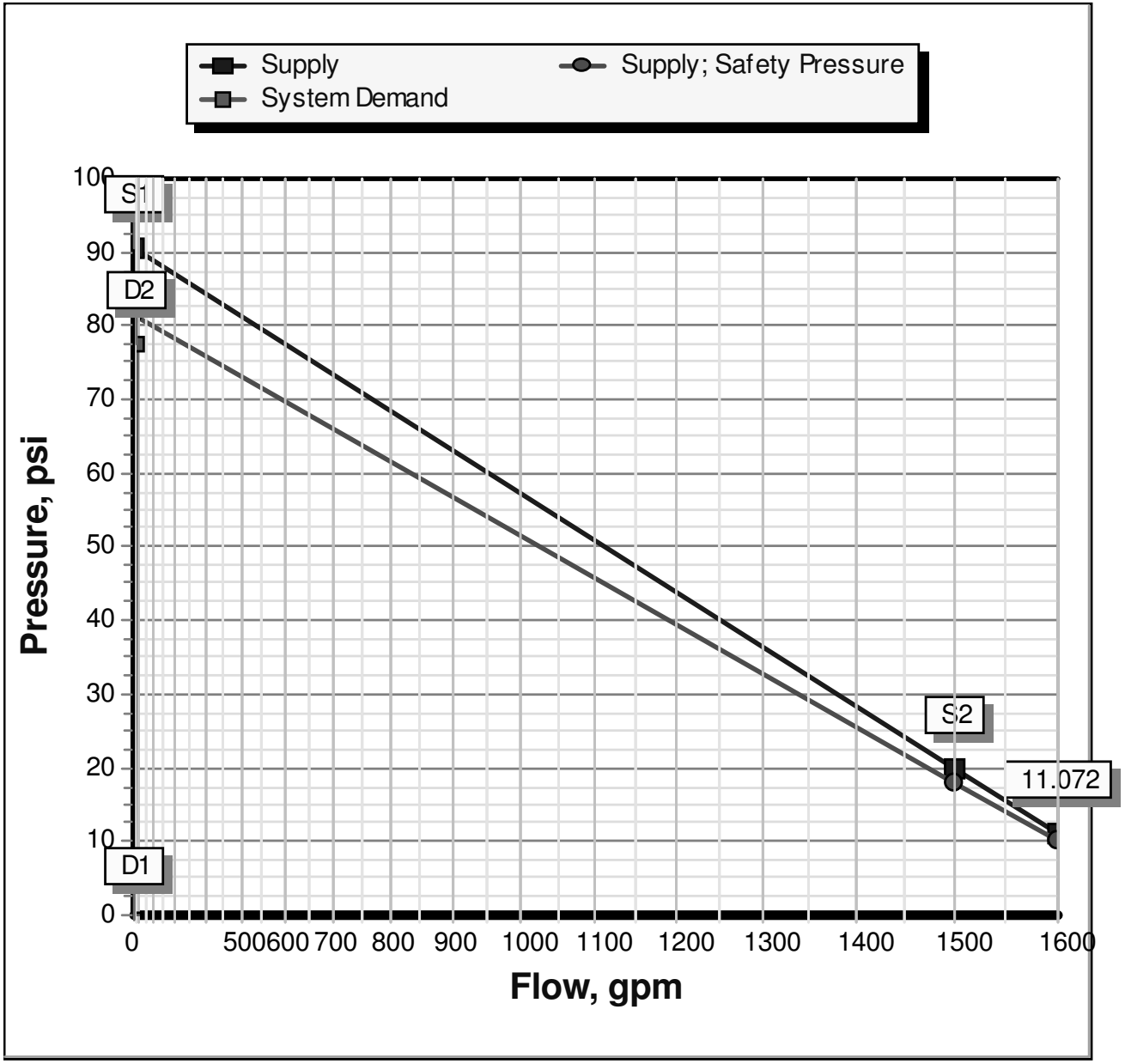
Hydraulic Analysis for : 4



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Hydraulic Analysis for : 4

Graph Labels

Label	Description	Values	
		Flow (gpm)	Pressure (psi)
S1	Supply point #1 - Static	0	90.4
S2	Supply point #2 - Residual	1500	20
D1	Elevation Pressure	0	-0.5
D2	System Demand	69.6	77.6

Curve Intersections & Safety Margins

Curve Name	Intersection		Safety Margin	
	Pressure (psi)	Flow (gpm)	Pressure (psi)	@ Flow (gpm)
Supply	90.1	75.5	12.5	69.6
Supply; Safety Pressure	81.1	71.3	3.5	69.6

Open Heads

Head Ref.	Head Type	Coverage	K-Factor	Required			Calculated		
				Density	Flow	Pressure	Density	Flow	Pressure
		(ft²)	(gpm/psi½)	(gpm/ft²)	(gpm)	(psi)	(gpm/ft²)	(gpm)	(psi)
401	Overhead Sprinkler	320	5.6	0.1	32	32.7	0.102	32.6	34
402	Overhead Sprinkler	320	5.6	0.1	32	32.7	0.1	32	32.7

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Node Data

Node# Type	Hgroup Fitting	K-Fact. Stat. Pres.	Elev Coverage	X Y
		gpm/psi½ psi	ft ft²	ft ft
402 Overhead Sprinkler	HEAD	5.6 0	7.75 320	-200.44 520.26
401 Overhead Sprinkler	HEAD	5.6 0	7.75 320	-216.86 520.26
117 Node	NODE BM.Tee	0	8.75	-200.44 513.85
025 Node	NODE BM.Tee	0	8.75	-220.54 519.43
006 Node	NODE BM.Tee	0	8.75	-220.54 513.85
029 Node	NODE coupling	0	8.75	-212.82 510.02
031 Node	NODE coupling	0	7.08	-211.82 510.02
032-O Node	NODE coupling	0	6.51	-211.82 510.02
032-I Node	NODE coupling	0	4.9	-211.82 510.02
033 Node	NODE bigstd90	0	3	-211.82 510.02
D4 Inside Hose	HOSE	0	3	-206.64 509.52
034 Node	NODE BM.Tee	0	3	-206.64 510.02
037-O Node	NODE coupling	0	3	-237.69 558.98
037-I Node	NODE coupling	0	3.01	-237.69 559.09
W1 Supply	SUPPLY	0	9	-236.41 609.55

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Pipe Data

Pipe Ref.	Type	Start	End	Size	HWC	Length	Fittings	Eq.Len.	Total Len.	Schedule	Velocity
						ft		ft	ft		ft/s
121	Brline	117	402	1	150	7.42	1(BM.Tee-Br);2(BM.90);	15	22.42	CPVC	10.78
117	Brline	006	117	1.25	150	20.1	3(BM.Tee-Run);1(BM.Tee-Br);	9	29.1	CPVC	6.73
006	Cmain	029	006	1.25	150	11.55	1(coupling);1(BM.90);	6	17.55	CPVC	13.59
008	Cmain	031	029	1.25	120	2.67	1(coupling);1(bigstd90);	3	5.67	40	13.87
009	Cmain	032-O	031	1.25	150	0.56	1(coupling);			CPVC	13.59
263	BFP	032-I	032-O	1.25	0	1.61				WILKINS 350	0
010	Cmain	033	032-I	1.25	120	1.9	1(bigstd90);	3	4.9	40	13.87
011	Cmain	034	033	1.5	150	5.18	1(BM.Tee-Br);	8	13.18	CPVC	10.34
015	Cmain	037-O	034	1.5	150	79.97	1(coupling);2(BM.90);	16	95.97	CPVC	11.14
264	VALVE	037-I	037-O	1	0	0.1				Sensus Meter	0
017	Cmain	W1	037-I	1.5	150	52.14	1(BM.Tee-Run);1(BM.90);	8	60.14	CPVC	11.14
003	Brline	025	401	1	150	5.51	1(BM.Tee-Br);2(BM.90);	15	20.51	CPVC	11
004	Cmain	006	025	1.25	150	5.58	1(BM.Tee-Run);	1	6.58	CPVC	6.86
012	Cmain	034	D4	1.5	150	0.5	1(BM.Tee-Run);	1	1.5	CPVC	0.8

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PIPE INFORMATION

Node 1 Node 2	Elev 1 Elev 2	K-Factor 1 K-Factor 2	Flow added(q)* Total flow (Q)	Nominal ID Actual ID	Fittings quantity x (name) = length	L F T	C Factor Pf per ft	total (Pt) elev (Pe) frict (Pf)	NOTES
	(ft)	(gpm/psi½)	(gpm)	(in)	(ft)	(ft)	(psi)	(psi)	
402 117	7.75 8.75	5.6	32 32	1 1.101	1x(BM.Tee-Br)=5 2x(BM.90)=10	7.42 15 22.42	150 0.1618	32.7 -0.4 3.6	
117 006	8.75 8.75		0 32	1.25 1.394	3x(BM.Tee-Run)=3 1x(BM.Tee-Br)=6	20.1 9 29.1	150 0.0513	35.8 0 1.5	
006 029	8.75 8.75		32.6 64.6	1.25 1.394	1x(BM.90)=6	11.55 6 17.55	150 0.1886	37.3 0 3.3	
029 031	8.75 7.08		0 64.6	1.25 1.38	1x(bigstd90)=3	2.67 3 5.67	120 0.2995	40.7 0.7 1.7	
031 032-O	7.08 6.51		0 64.6	1.25 1.394		0.56 0 0.56	150 0.1886	43.1 0.2 0.1	
032-O 032-I	6.51 4.9		0 64.6	1.25 0		1.61 0 1.61	0 3.9255	43.4 0.7 6.3	WILKINS 350
032-I 033	4.9 3		0 64.6	1.25 1.38	1x(bigstd90)=3	1.9 3 4.9	120 0.2995	50.5 0.8 1.5	
033 034	3 3		0 64.6	1.5 1.598	1x(BM.Tee-Br)=8	5.18 8 13.18	150 0.097	52.7 0 1.3	
034 037-O	3 3		5 69.6	1.5 1.598	2x(BM.90)=16	79.97 16 95.97	150 0.1113	54 0 10.7	
037-O 037-I	3 3.01		0 69.6	1 0		0.1 0 0.1	0 84.0274	64.7 0 8.8	Sensus Meter
037-I W1	3.01 9		0 69.6	1.5 1.598	1x(BM.Tee-Run)=1 1x(BM.90)=8	52.14 8 60.14	150 0.1113	73.5 -2.6 6.7	
401 025	7.75 8.75	5.6	32.6 32.6	1 1.101	1x(BM.Tee-Br)=5 2x(BM.90)=10	5.51 15 20.51	150 0.1679	34 -0.4 3.4	
025 006	8.75 8.75		0 32.6	1.25 1.394	1x(BM.Tee-Run)=1	5.58 1 6.58	150 0.0532	37 0 0.4	
D4 034	3 3		5 5	1.5 1.598	1x(BM.Tee-Run)=1	0.5 1 1.5	150 0.0008	54 0 0	

* Discharge shown for flowing nodes only

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PIPE INFORMATION

Node 1 Node 2	Elev 1 Elev 2	K-Factor 1 K-Factor 2	Flow added (q) Total flow (Q)	Nominal ID Actual ID	Fittings quantity x (name) = length	L F T	C Factor Pf per ft	total (Pt) elev (Pe) frict (Pf)	NOTES
	(ft)	(gpm/psi½)	(gpm)	(in)	(ft)	(ft)	(psi)	(psi)	
Path No: 1									
402	7.75	5.6	32	1	1x(BM.Tee-Br)=5	7.42	150	32.7	
117	8.75		32	1.101	2x(BM.90)=10	15	0.1618	-0.4	
						22.42		3.6	
117	8.75		0	1.25	3x(BM.Tee-Run)=3	20.1	150	35.8	
006	8.75		32	1.394	1x(BM.Tee-Br)=6	9	0.0513	0	
						29.1		1.5	
006	8.75		32.6	1.25	1x(BM.90)=6	11.55	150	37.3	
029	8.75		64.6	1.394		6	0.1886	0	
						17.55		3.3	
029	8.75		0	1.25	1x(bigstd90)=3	2.67	120	40.7	
031	7.08		64.6	1.38		3	0.2995	0.7	
						5.67		1.7	
031	7.08		0	1.25		0.56	150	43.1	
032-O	6.51		64.6	1.394		0	0.1886	0.2	
						0.56		0.1	
032-O	6.51		0	1.25		1.61	0	43.4	WILKINS 350
032-I	4.9		64.6	0		0	3.9255	0.7	
						1.61		6.3	
032-I	4.9		0	1.25	1x(bigstd90)=3	1.9	120	50.5	
033	3		64.6	1.38		3	0.2995	0.8	
						4.9		1.5	
033	3		0	1.5	1x(BM.Tee-Br)=8	5.18	150	52.7	
034	3		64.6	1.598		8	0.097	0	
						13.18		1.3	
034	3		5	1.5	2x(BM.90)=16	79.97	150	54	
037-O	3		69.6	1.598		16	0.1113	0	
						95.97		10.7	
037-O	3		0	1		0.1	0	64.7	Sensus Meter
037-I	3.01		69.6	0		0	84.0274	0	
						0.1		8.8	
037-I	3.01		0	1.5	1x(BM.Tee-Run)=1	52.14	150	73.5	
W1	9		69.6	1.598	1x(BM.90)=8	8	0.1113	-2.6	
						60.14		6.7	
W1								**77.6**	
Path No: 2									
401	7.75	5.6	32.6	1	1x(BM.Tee-Br)=5	5.51	150	34	
025	8.75		32.6	1.101	2x(BM.90)=10	15	0.1679	-0.4	
						20.51		3.4	
025	8.75		0	1.25	1x(BM.Tee-Run)=1	5.58	150	37	
006	8.75		32.6	1.394		1	0.0532	0	
						6.58		0.4	
006								**37.3**	
Path No: 3									
D4	3		5	1.5	1x(BM.Tee-Run)=1	0.5	150	54	
034	3		5	1.598		1	0.0008	0	
						1.5		0	
034								**54**	

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PIPE INFORMATION

Node 1 Node 2	Elev 1 Elev 2	K-Factor 1 K-Factor 2	Flow added (q) Total flow (Q)	Nominal ID Actual ID	Fittings quantity x (name) = length	L F T	C Factor Pf per ft	total (Pt) elev (Pe) frict (Pf)	NOTES
	(ft)	(gpm/psi½)	(gpm)	(in)	(ft)	(ft)	(psi)	(psi)	

* Pressures are balanced to a high degree of accuracy. Values may vary by 0.1 psi due to display rounding.

* Maximum Velocity of 13.87 ft/s occurs in the following pipe(s): (031-029), (033-032-I)

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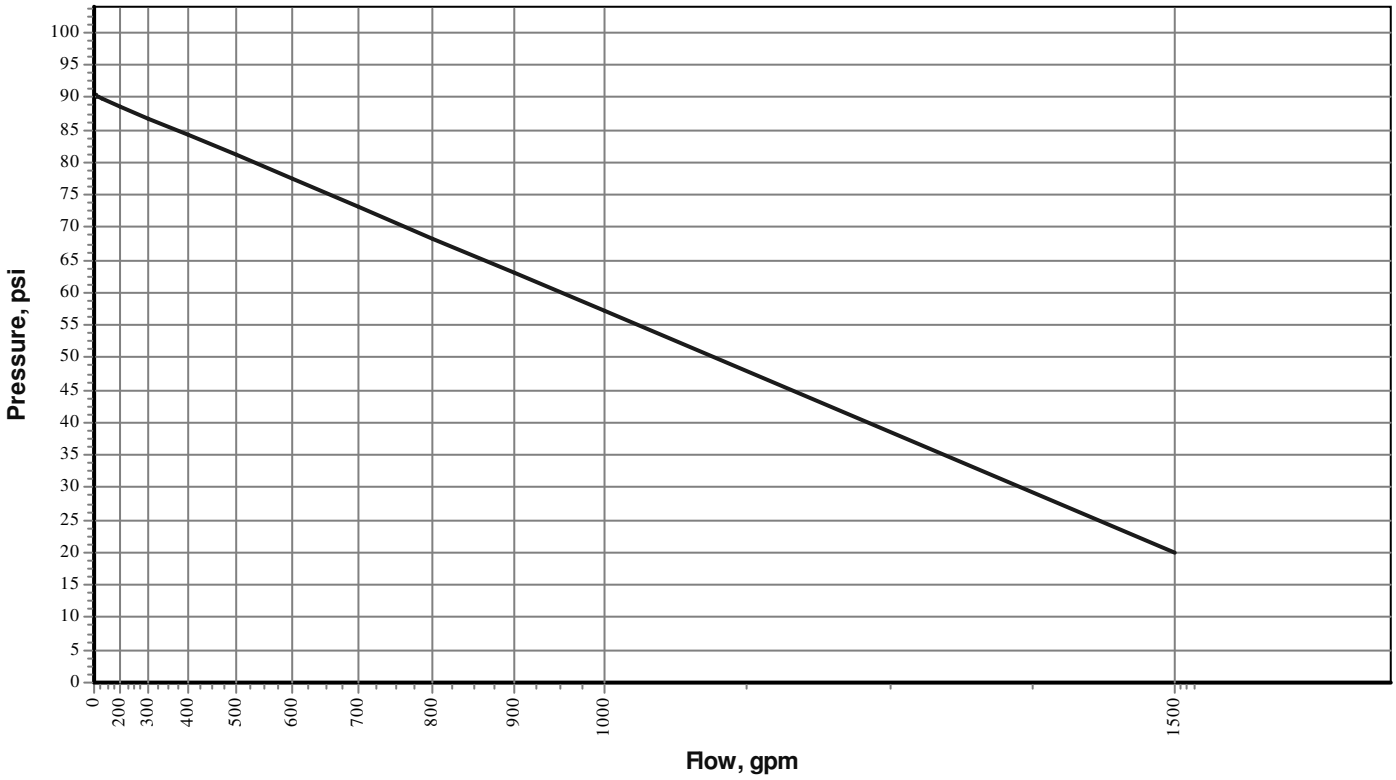
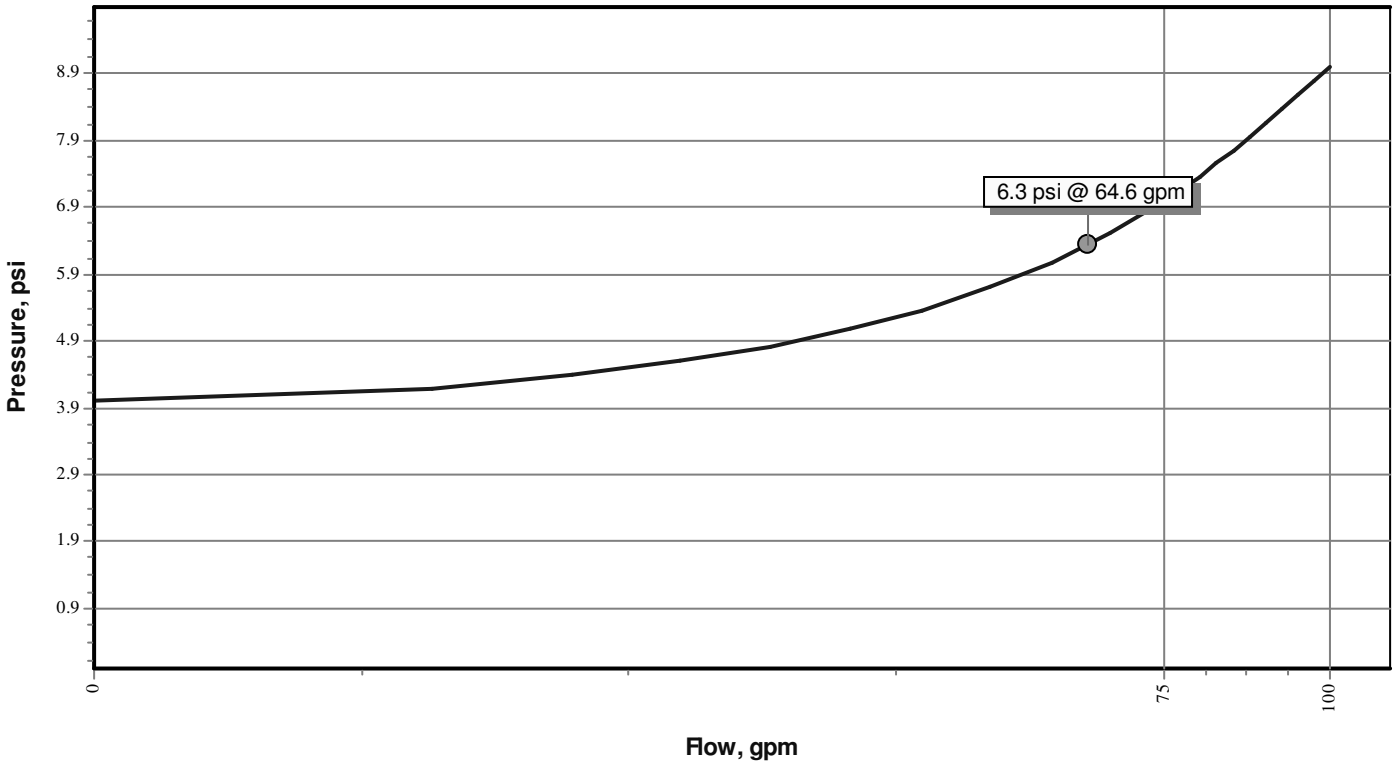
Pressure vs. Flow Function
Design Area: 4; Supply Ref.: W1; Supply Name:W1



Pressure Loss Function
Design Area: 4; BFP Ref.: 263 (WILKINS 350, Size = 1.25)



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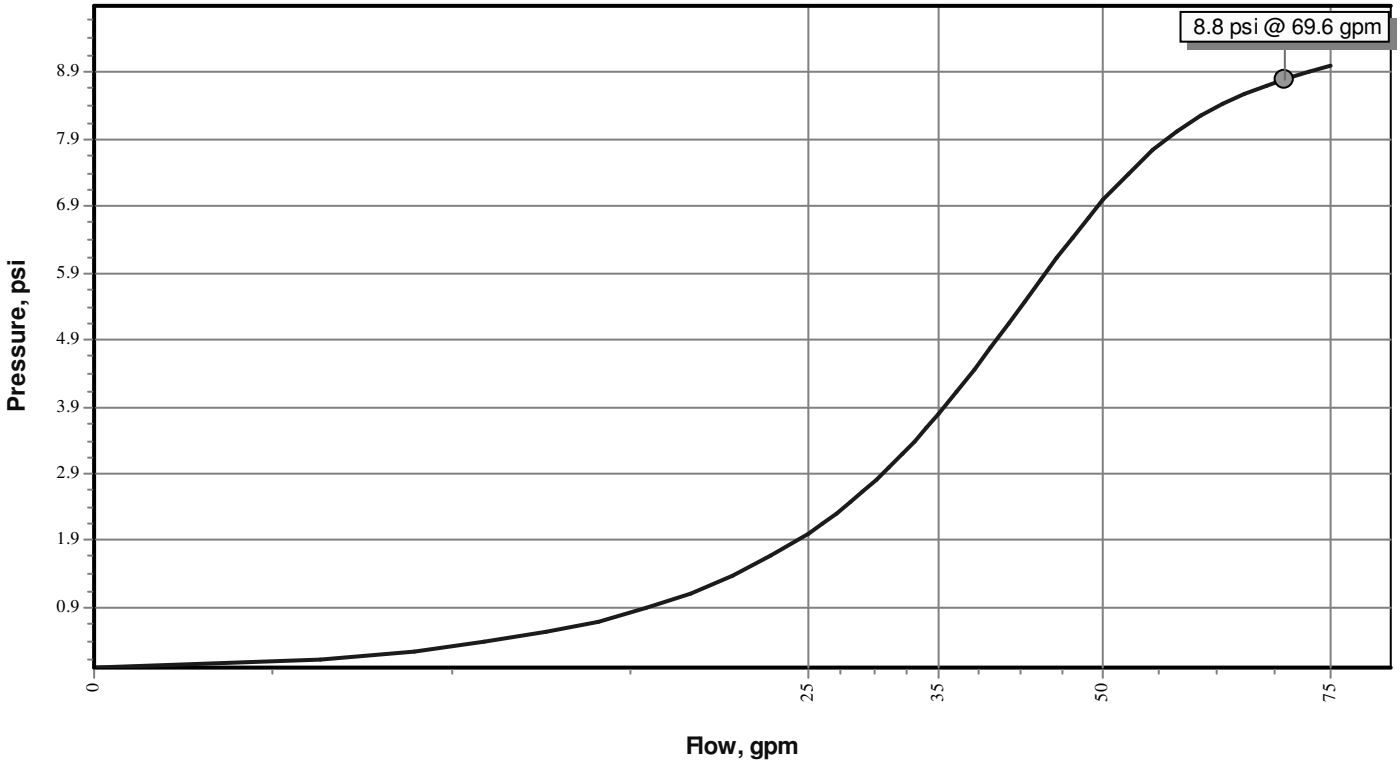
Pressure Loss Function
Design Area: 4; Valve Ref.: 264 (Sensus Meter, Size = 1)



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