

RESIDENTIAL SPRINKLER SYSTEM  
HYDRAULICS CALCULATION REPORT

FOR  
Copperberry South bld  
Puyallup  
4002 10th St se

Date: 5/18/2023  
File No:  
Data File Name: Copperberry SOUTH BLD Puyallup.rdf

SPRINKLER SPACING

324.0 sq. ft./spklr.(max)      Max. Dist. Bet. Spklrs:      18.0 ft.  
Min. Dist. Bet. Spklrs: 8.0      Max. Dist. Spklr. to Wall: 9.0 ft.

SPRINKLER SPECIFICATIONS

Mfr: Reliable Descr: RA0616    RFC49 Fl Conc .Pend.(18x18) K=4.90  
Calculated K Factor for Arm-Overs & Drops:  
    1.0 ft. x 1.101 in. Drop:      K=4.84 (Incl. 1 Tee)  
    0.0 ft. x 1.101 in. Arm-Over: K=4.82 (Incl. 1 Tee & 1 Ell)

PIPE SPECIFICATIONS

Type: CPVC S-40 HWC: 150

WATER SUPPLY

Source: Public Test Date: By:  
Static: 60.0 psi Resid: 20.0 psi Flow: 750.0 gpm  
Public Main Size: 10 in  
Domestic Demand: 0.0 gpm at node number 0

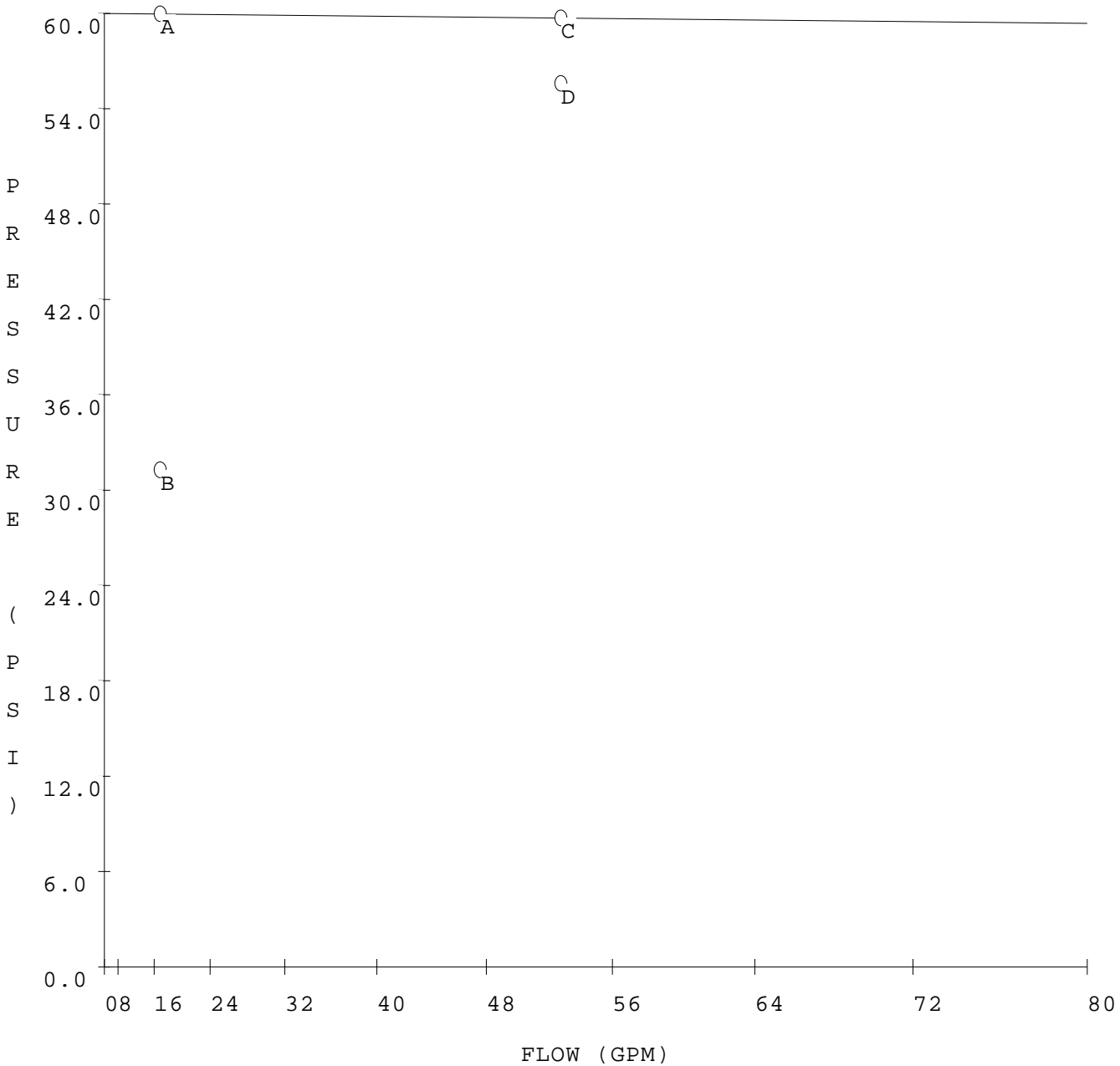
SPRINKLER DEMAND

No.Spklrs. Flowing	Min Spklr. Flow	Press. (psi)	Node No.	Total Flow	Avail. Press.	Req'd Press.
1	17.0	12.3	1	17.0	60.0	31.3
3	17.0	12.3	1	52.9	59.7	55.6

REVIEWING AUTHORITY

City of Puyallup

WATER SUPPLY CURVE



Static = 60.0 psi, Residual = 20.0 psi @ 750 gpm

(1 sprinkler flowing)

(3 sprinklers flowing)

A = Available Water Supply

C = Available Water Supply

60.0 psi @ 17.0 gpm

59.7 psi @ 52.9 gpm

B = Required Water Supply

D = Required Water Supply

31.3 psi @ 17.0 gpm

55.6 psi @ 52.9 gpm

RESULTS OF ANALYSIS

NFPA NODE & PIPE DATA

1 Sprinkler Flowing

Node Tag	Elevation (FT)	Node Type	Pressure (PSI)	Discharge (GPM)	Notes
1	10.0	K= 4.84	12.3	17.0	
2	10.0	- - - -	13.2	- - -	
3	10.0	- - - -	13.7	- - -	
4	10.0	- - - -	13.7	- - -	
5	10.0	- - - -	15.5	- - -	
6	10.0	- - - -	16.3	- - -	
7	10.0	- - - -	16.4	- - -	
8	0.0	- - - -	21.0	- - -	
9	0.0	- - - -	26.0	- - -	
10	0.0	- - - -	26.3	- - -	
11	0.0	SOURCE	31.3	- - -	
20	10.0	- - - -	15.7	- - -	

Pipe Tag	K-fac	AF	AF to	L	C	(Pt)	Notes				
Frm Node	El (ft)	PT	(q)	node/	Nom ID	Fit	F	T	FL/FT	(Pe)	(Pf)
To Node	El (ft)	PT	TF(Q)	disch	Act ID						
Pipe: 1	4.84					R: 1	11.00	150		13.2	
2	10.0	13.2	17.0	Disch	1.000	B: 5	6.00			0.0	
1	10.0	12.3	17.0		1.101		17.00	0.050		0.9	
Pipe: 2	0.00						6.00	150		13.7	
4	10.0	13.7	17.0	1	1.000	B: 5	5.00			0.0	
2	10.0	13.2	17.0		1.101		11.00	0.050		0.6	
Pipe: 3	0.00						12.00	150		13.7	
4	10.0	13.7	0.0		1.000	B: 5	5.00			0.0	
3	10.0	13.7	0.0		1.101		17.00	0.000		-0.0	
Pipe: 4	0.00					R: 1	29.00	150		15.5	
5	10.0	15.5	17.0	2	1.000	B: 5	6.00			0.0	
4	10.0	13.7	17.0		1.101		35.00	0.050		1.8	
Pipe: 5	0.00					2R: 2	61.00	150		16.3	
6	10.0	16.3	-5.2	20	1.250	5B:30	32.00			0.0	
5	10.0	15.5	11.8		1.394		93.00	0.008		0.8	
Pipe: 6	0.00						3.00	150		16.4	
7	10.0	16.4	11.8	5	1.250	B: 6	6.00			0.0	
6	10.0	16.3	17.0		1.394		9.00	0.016		0.1	
Pipe: 7	0.00						10.00	150		21.0	
8	0.0	21.0	17.0	6	1.250	3R: 3	3.00			4.3	
7	10.0	16.4	17.0		1.394		13.00	0.016		0.2	
Pipe: 8	0.00						1.00	150		26.0	
9	0.0	26.0	17.0	7	1.250	----	0.00			0.0	
8	0.0	21.0	17.0		1.394		1.00	0.016		5.0	
Fixed Pressure Loss Device: 5.00 psi											
Pipe: 9	0.00					B:10	80.00	150		26.3	
10	0.0	26.3	17.0	8	2.000	2L:18	28.00			0.0	

9	0.0	26.0	17.0		2.003		108.00	0.003	0.3
Pipe: 10		SOURCE					1.00	150	31.3
11	0.0	31.3	17.0	9	2.000	----	0.00		0.0
10	0.0	26.3	17.0		2.003		1.00	0.003	5.0
Fixed Pressure Loss Device: 5.00 psi									
Pipe: 11		0.00				2B:10	69.00	150	16.3
6	10.0	16.3	5.2	5	1.000	2L:10	29.00		0.0
20	10.0	15.7	5.2		1.101	9R: 9	98.00	0.006	0.5
Pipe: 12		0.00	17.0	4		4R: 4	30.00	150	15.7
20	10.0	15.7	-11.8	6	1.000	B: 5	9.00		0.0
5	10.0	15.5	5.2		1.101		39.00	0.006	0.2

RESULTS OF ANALYSIS

NFPA NODE & PIPE DATA

3 Sprinklers Flowing

Node Tag	Elevation (FT)	Node Type	Pressure (PSI)	Discharge (GPM)	Notes
1	10.0	K= 4.84	12.3	17.0	
2	10.0	K= 4.84	13.2	17.6	
3	10.0	K= 4.84	14.3	18.3	
4	10.0	- - - -	15.3	- - -	
5	10.0	- - - -	29.6	- - -	
6	10.0	- - - -	35.8	- - -	
7	10.0	- - - -	37.0	- - -	
8	0.0	- - - -	43.0	- - -	
9	0.0	- - - -	48.2	- - -	
10	0.0	- - - -	50.6	- - -	
11	0.0	SOURCE	55.6	- - -	
20	10.0	- - - -	31.4	- - -	

Pipe Tag	K-fac	AF	AF to	Nom ID	Fit	L	C	(Pt)	Notes
Frm Node	El (ft)	PT	(q)	node/		F	FL/FT	(Pe)	
To Node	El (ft)	PT	TF(Q)	disch	Act ID	T		(Pf)	
Pipe: 1	4.84					R: 1	11.00	150	13.2
2	10.0	13.2	17.0	Disch	1.000	B: 5	6.00		0.0
1	10.0	12.3	17.0		1.101		17.00	0.050	0.9
Pipe: 2	4.84		17.6	Disch			6.00	150	15.3
4	10.0	15.3	17.0	1	1.000	B: 5	5.00		0.0
2	10.0	13.2	34.6		1.101		11.00	0.187	2.1
Pipe: 3	4.84						12.00	150	15.3
4	10.0	15.3	18.3	Disch	1.000	B: 5	5.00		0.0
3	10.0	14.3	18.3		1.101		17.00	0.058	1.0
Pipe: 4	0.00		18.3	3		R: 1	29.00	150	29.6
5	10.0	29.6	34.6	2	1.000	B: 5	6.00		0.0
4	10.0	15.3	52.9		1.101		35.00	0.411	14.4
Pipe: 5	0.00		52.9	4		2R: 2	61.00	150	35.8
6	10.0	35.8	-16.0	20	1.250	5B:30	32.00		0.0
5	10.0	29.6	36.8		1.394		93.00	0.067	6.2

Pipe:	6	0.00	16.0	20			3.00	150	37.0	
	7	10.0	37.0	36.8	5	1.250	B: 6	6.00	0.0	
	6	10.0	35.8	52.9		1.394		9.00	0.130	
									1.2	
Pipe:	7	0.00					10.00	150	43.0	
	8	0.0	43.0	52.9	6	1.250	3R: 3	3.00	4.3	
	7	10.0	37.0	52.9		1.394		13.00	0.130	
									1.7	
Pipe:	8	0.00					1.00	150	48.2	
	9	0.0	48.2	52.9	7	1.250	----	0.00	0.0	
	8	0.0	43.0	52.9		1.394		1.00	0.130	
									5.1	
									Fixed Pressure Loss Device: 5.0 psi	
Pipe:	9	0.00					B:10	80.00	150	50.6
	10	0.0	50.6	52.9	8	2.000	2L:18	28.00	0.0	
	9	0.0	48.2	52.9		2.003		108.00	0.022	
									2.4	
Pipe:	10	SOURCE						1.00	150	55.6
	11	0.0	55.6	52.9	9	2.000	----	0.00	0.0	
	10	0.0	50.6	52.9		2.003		1.00	0.022	
									5.0	
									Fixed Pressure Loss Device: 5.0 psi	
Pipe:	11	0.00					2B:10	69.00	150	35.8
	6	10.0	35.8	16.0	5	1.000	2L:10	29.00	0.0	
	20	10.0	31.4	16.0		1.101	9R: 9	98.00	0.045	
									4.4	
Pipe:	12	0.00	52.9	4			4R: 4	30.00	150	31.4
	20	10.0	31.4	-36.8	6	1.000	B: 5	9.00	0.0	
	5	10.0	29.6	16.0		1.101		39.00	0.045	
									1.8	

Legend:

PT - Total Pressure at Node	C - Hazen-Williams Coefficient
Fl - Flow rate (gpm)	FL/FT - Friction Loss per Foot
L - Pipe Length	Pt - Total Pressure Loss
F - Fitting Length	Pe - Elevation Pressure Loss
T - Total Length of Pipe	Pf - Friction Pressure Loss

Fitting Code Letters:

E=45 Ell, L=90 Ell, B=TeeBch, R=TeeRun, C=Couplg, S=SwgChk, G=GatVlv, X= X, Y= Y,

The maximum velocity of water flow occurs in pipe 1  
at 5.73 ft/s with 1 sprinkler flowing.

The maximum velocity of water flow occurs in pipe 4  
at 17.82 ft/s with 3 sprinklers flowing.

PIPE FITTINGS TABLE

Pipe Table Name: standard

PAGE: C MATERIAL: CPVC S-40 HWC: 150

Diameter (in)	Equivalent Fitting Lengths in Feet										
	E	L	B	R	C	S	G	X	Y	Z	
	45 Ell	90 Ell	TeeBch	TeeRun	Couplg	SwgChk	GatVlv	X	Y	Z	
1.101	1.00	5.00	5.00	1.00	1.00	8.00	2.00	0.00	0.00	0.00	
1.394	2.00	6.00	6.00	1.00	1.00	11.00	3.00	0.00	0.00	0.00	
2.003	2.00	9.00	10.00	1.00	1.00	17.00	3.00	0.00	0.00	0.00	

A negative value for flow rate indicates the direction of flow is from the second pipe node  
A Fixed Pressure Loss Device calculates as a positive friction loss  
A Fire Pump calculates as a negative friction loss

Sprinkler system has been hydraulically calculated with the HASS HOUSE 2021.0.01 computer program (License No. ) to provide an average imbalance of 0.010 gpm at each node and a maximum imbalance of 0.10 gpm with one sprinkler flowing, and 0.010 gpm at each node and maximum imbalance of 0.05 gpm with 3 sprinklers flowing in accordance with NFPA 13 and 13D or 13R. The minimum source pressure is 20.0 psi with a minimum required pressure of 55.6 psi and a 30 minute flow of 1586 gallons. The minimum pressure at any node is 12.3 psi at node 1.

Under full flow conditions the available pressure is 59.7 psi and a 30 minute flow of 1650 gallons. of 59.7 psi The minimum pressure at any node is 13.6 psi at node 1.

HRS Systems, Inc.  
208 Southside Square  
Petersburg, TN 37144  
(931) 659-9760