



FIRE SPRINKLER HYDRAULIC & SEISMIC CALCULATIONS

FOR

PRO VAC
2511 INTER AVE
PUYALLUP, WA 98372



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SECTION A

HYDRAULIC CALCULATIONS



MEMORANDUM

TO: BRIAN JOHNSON, WATER SYSTEM
SPECIALIST
FROM: KERRI SIDEBOTTOM, P.E.
DATE: JANUARY 4, 2022
SUBJECT: 2511 INTER AVENUE SE FIRE FLOW
AVAILABILITY
CITY OF PUYALLUP, PIERCE COUNTY,
WASHINGTON
G&O #21415.08

Per your request, I have analyzed the available fire flow at two existing hydrants located at 2511 Inter Avenue SE, in the central part of the City's water service area. The setup of the hydraulic model and the assumptions used to determine the static pressure and available fire flow are noted below:

- The available fire flows and pressures are measured at Nodes J-135 and J2130, corresponding to existing Hydrants SE232 and SE764, respectively, as shown on the attached Figure 1.
- Water system demands are based on projected 2038 demands and reservoirs are depleted of fire suppression and equalizing storage, as established in the 2019 Water System Plan (WSP) approved by the Washington State Department of Health (DOH). The City's water model was updated in 2021 to reflect additional system improvements since the WSP was developed.
- All pump stations are idle and the Salmon Springs source is operating at 1,100 gpm.

The hydrants are located Zone 1, which is supplied by Maplewood Springs and the 15th Avenue SE Reservoirs. The system was modeled as-is, with no new piping proposed at this time.

The available pressure under 2038 peak hour demands at the hydrant is included in Table 1.



TABLE 1

Peak Hour Pressure

Node	Hydrant	Elevation (ft)	Peak Hour Pressure (psi)
J-135	SE232	60	45
J2130	SE764	60	45

Available fire flow was measured at two existing hydrants. Hydrant SE232 (Node J-135) is located on an existing 12-inch main along Inter Avenue SE, and Hydrant SE764 (Node J2130) is located on an existing 8-inch dead-end main extending north from Inter Avenue SE to the site. The results of this modeling are included in Table 2. The modeled fire flow is available at either hydrant individually, but not both simultaneously.

TABLE 2

Modeled Fire Flow Availability

Node	Hydrant	Available Fire Flow (gpm)	Residual Pressure at Available Fire Flow (psi)	Minimum System Pressure at Available Fire Flow (psi)
J-135	SE232	4,910 ⁽¹⁾	20	20
J2130	SE764	1,560 ⁽²⁾	30	30

(1) Limited by minimum pressure of 20 psi at service locations system-wide.

(2) Limited by maximum system-wide velocity of 10 fps.

Fire flow to Hydrant SE764 is limited by the 10 fps maximum velocity through the existing 8-inch pipe, while fire flow to Hydrant SE232 is limited by low pressure at the hydrant location.

The DOH and City standards for water distribution systems are to meet the peak hourly demand of the system while providing a minimum pressure of 30 psi system-wide. Under peak daily demand with a fire flow, the system is designed to maintain a minimum pressure of 20 psi system-wide. Although the peak hourly demand pressure may currently be higher than these standards, the developer must recognize that the City may not provide pressure higher than 30 psi in the future. The flows and pressures determined in this memo are based on the approximate hydrant elevation at ground level. The developer may design their sprinkler system for whatever pressure they wish; however, they must recognize and be responsible for conditions when the pressure may be less than currently exists.

THE MAP FEATURES ARE APPROXIMATE AND
ARE INTENDED ONLY TO PROVIDE AN
INDICATION OF SAID FEATURE. THIS IS NOT
A SURVEY. THE CITY ASSUMES NO
LIABILITY FOR VARIATIONS ASCERTAINED
BY ACTUAL SURVEY. ALL DATA IS
EXPRESSLY PROVIDED 'AS IS' AND 'WITH ALL
FAULTS'. THE CITY MAKES NO WARRANTY
OF FITNESS FOR A PARTICULAR PURPOSE.

2504 E MAIN

SE 951

SE 949

12" D.I.

SE 950

Node J2130
Elevation: 60 ft
PHD Pressure: 45 psi
Modeled Fire Flow: 1,560 gpm

2511

2415

PARKING
AREA

2533
A-B-C

8" D.I.

SE 764

SE 786

2505

PARKING AREA

2525

SE 232

4" FIRE
SERVICES

2531
A-B-C

SERVICES

8" D.I.

SE 455

12" C.I.

INTER AVE SE

2422

Node J-135
Elevation: 60 ft
PHD Pressure: 45 psi
Modeled Fire Flow: 4,910 gpm

0 50 100 150 200 FEET



CITY OF PUYALLUP
PUBLIC WORKS
WATER DIVISION

HYDRAULIC MODEL FOR 2511 INTER AVE SE

SCALE AS SHOWN

12/29/2021

COP\PW\WATER\S_MAINT\PDF\QSEC\
PG104\MODEL FOR 2511 INTER AVE

FIRE SPRINKLERS INC.
1524 45th St E, SUITE 102
SUMNER, WA 98390

HYDRAULIC CALCULATIONS

FOR

PRO-VAC
2511 INTER AVE
PUYALLUP, WA 98372

REMOTE AREA 1

FILE NUMBER: 4632
DATE: 02/10/2022

-DESIGN DATA-

OCCUPANCY CLASSIFICATION:	NFPA 13
DENSITY:	.2 gpm/sq. ft.
AREA OF APPLICATION:	1156 sq. ft.
COVERAGE PER SPRINKLER:	130 sq. ft.
NUMBER OF SPRINKLERS CALCULATED:	11 sprinklers
TOTAL SPRINKLER WATER FLOW REQUIRED:	298.1 gpm
TOTAL WATER REQUIRED (including hose):	298.2 gpm
FLOW AND PRESSURE (@ BOR):	298.1 gpm @BOR 35.5 psi
SPRINKLER ORIFICE SIZE:	8.0=K
SPRINKLER TYPE:	Vk3501
SPRINKLER TEMP:	155°
NAME OF CONTRACTOR:	FIRE SPRINKLERS INC
DESIGN/LAYOUT BY:	H. BAUMANN
AUTHORITY HAVING JURISDICTION:	CITY OF PUYALLUP
CONTRACTOR CERTIFICATION NUMBER:	FIRESI*988RJ

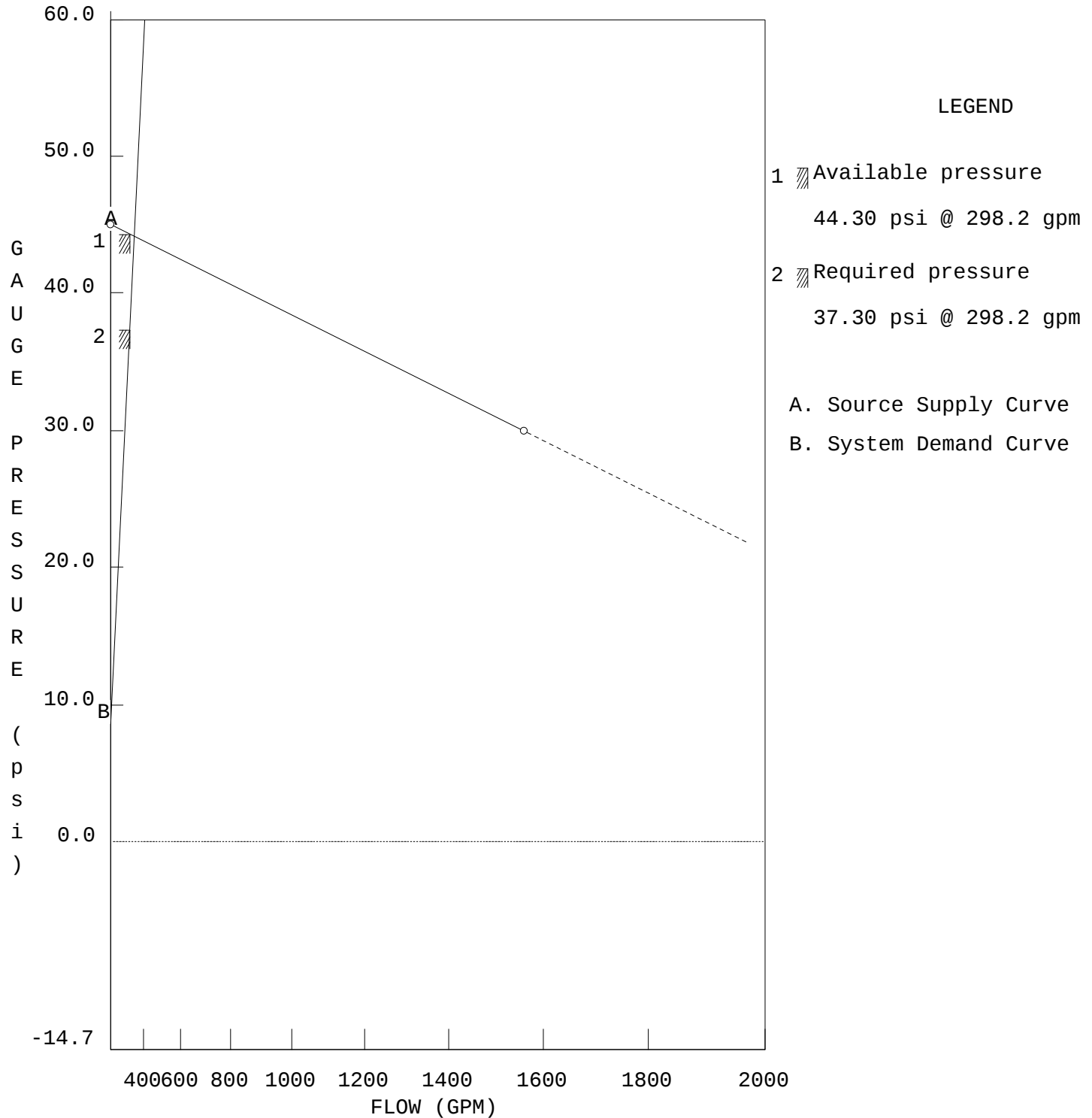
CALCULATIONS BY HASS COMPUTER PROGRAM (LICENSE # 38011601)
HRS SYSTEMS, INC.

DATE: 2/10/2022 TIONS\01-HYDRAULIC\4632-PROVAC-HYDRAULIC CALCS - AREA1.SDF

JOB TITLE:

WATER SUPPLY ANALYSIS

Static: 45.00 psi Resid: 30.00 psi Flow: 1560.0 gpm



Note: (1) Dashed Lines indicate extrapolated values from Test Results

DATE: 2/10/2022 TIONS\01-HYDRAULIC\4632-PROVAC-HYDRAULIC CALCS - AREA1.SDF

JOB TITLE:

NFPA WATER SUPPLY DATA

SOURCE NODE TAG	STATIC PRESS. (PSI)	RESID. PRESS. (PSI)	FLOW @ (GPM)	AVAIL. PRESS. (PSI)	TOTAL @ DEMAND (GPM)	REQ'D PRESS. (PSI)
SRC	45.0	30.0	1560.0	44.3	298.2	37.3

AGGREGATE FLOW ANALYSIS:

TOTAL FLOW AT SOURCE	298.2 GPM
TOTAL HOSE STREAM ALLOWANCE AT SOURCE	0.0 GPM
OTHER HOSE STREAM ALLOWANCES	0.0 GPM
TOTAL DISCHARGE FROM ACTIVE SPRINKLERS	298.2 GPM

NODE ANALYSIS DATA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)	AREA (FT^2)	DENSITY REQ. ACT. (GPM/FT^2)	NOTES
1001	16.0	K= 8.00	12.0	27.7	130.0	0.200 0.213	
1002	16.4	K= 8.00	11.1	26.6	130.0	0.200 0.205	
1003	16.8	K= 8.00	10.6	26.0	130.0	0.200 0.200	
1004	16.8	K= 8.00	10.6	26.0	130.0	0.200 0.200	
1005	16.4	K= 8.00	10.9	26.4	130.0	0.200 0.203	
1006	16.0	K= 8.00	11.5	27.2	130.0	0.200 0.209	
1007	16.4	K= 8.00	12.3	28.1	130.0	0.200 0.216	
1008	16.8	K= 8.00	11.7	27.3	130.0	0.200 0.210	
1009	16.8	K= 8.00	11.6	27.2	130.0	0.200 0.209	
1010	16.4	K= 8.00	11.8	27.5	130.0	0.200 0.212	
1011	16.0	K= 8.00	12.4	28.1	130.0	0.200 0.216	
101	14.0	- - - -	16.2	- - -	- - -	- - - - - -	
102	14.0	- - - -	16.4	- - -	- - -	- - - - - -	
103	14.0	- - - -	17.0	- - -	- - -	- - - - - -	
104	14.0	- - - -	17.6	- - -	- - -	- - - - - -	
105	14.0	- - - -	17.9	- - -	- - -	- - - - - -	
106	14.0	- - - -	18.3	- - -	- - -	- - - - - -	
107	14.0	- - - -	18.6	- - -	- - -	- - - - - -	
108	14.0	- - - -	18.8	- - -	- - -	- - - - - -	
109	14.0	- - - -	19.0	- - -	- - -	- - - - - -	
110	14.0	- - - -	19.3	- - -	- - -	- - - - - -	
113	14.0	- - - -	18.0	- - -	- - -	- - - - - -	
114	14.0	- - - -	18.1	- - -	- - -	- - - - - -	
115	14.0	- - - -	18.2	- - -	- - -	- - - - - -	
116	14.0	- - - -	18.3	- - -	- - -	- - - - - -	
117	14.0	- - - -	18.4	- - -	- - -	- - - - - -	
118	14.0	- - - -	18.5	- - -	- - -	- - - - - -	
119	14.0	- - - -	18.7	- - -	- - -	- - - - - -	
120	14.0	- - - -	18.8	- - -	- - -	- - - - - -	
121	14.0	- - - -	19.0	- - -	- - -	- - - - - -	
122	14.0	- - - -	19.1	- - -	- - -	- - - - - -	
111	14.0	- - - -	19.3	- - -	- - -	- - - - - -	
123	14.0	- - - -	19.2	- - -	- - -	- - - - - -	
112	14.0	- - - -	19.8	- - -	- - -	- - - - - -	
124	14.0	- - - -	20.0	- - -	- - -	- - - - - -	

DATE: 2/10/2022 TIONS\01-HYDRAULIC\4632-PROVAC-HYDRAULIC CALCS - AREA1.SDF

JOB TITLE:

NODE ANALYSIS DATA

NODE	TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)	AREA (FT^2)	DENSITY		NOTES
							REQ.	ACT.	
601		7.0	- - - -	24.0	- - -	- - -	- - -	- - -	
TOR		7.0	- - - -	25.5	- - -	- - -	- - -	- - -	
BF2		3.0	- - - -	27.6	- - -	- - -	- - -	- - -	
BF1		3.0	- - - -	34.1	- - -	- - -	- - -	- - -	
BOR		0.0	- - - -	35.5	- - -	- - -	- - -	- - -	
SRC		-3.0	SOURCE	37.3	298.2	- - -	- - -	- - -	

DATE: 2/10/2022 TIONS\01-HYDRAULIC\4632-PROVAC-HYDRAULIC CALCS - AREA1.SDF

JOB TITLE:

NFPA PIPE DATA

Pipe Tag	K-fac	Add Fl	Add Fl	To	Fit:	L	C	(Pt)	
Frm Node	PT	(q)	Node/	Nom ID	Eq.Ln.	F	Pf/ft.	(Pe)	Notes
To Node	PT	Tot.(Q)	Disch	Act ID	(ft.)	T		(Pf)	
Pipe: 1	8.00	26.4	Disch			8.00	120	0.7	
1006	16.0	20.1	1004	1.500	----	0.00		0.2	
1005	16.4	46.5		1.682		8.00	0.062	0.5	
Pipe: 2	8.00	26.0	Disch			9.00	120	0.3	
1005	16.4	-5.9		1.500	----	0.00		0.2	
1004	16.8	20.1		1.682		9.00	0.013	0.1	
Pipe: 3	8.00	26.0	Disch			9.30	120	0.0	
1003	16.8	-20.1		1.500	2E: 9.9	9.90		-0.0	
1004	16.8	5.9		1.682		19.20	0.001	0.0	
Pipe: 4	8.00	26.0	Disch			9.00	120	0.5	
1002	16.4	5.9	1004	1.500	----	0.00		0.2	
1003	16.8	31.9		1.682		9.00	0.031	0.3	
Pipe: 5	8.00	26.6	Disch			8.00	120	0.9	
1001	16.0	31.9	1003	1.500	----	0.00		0.2	
1002	16.4	58.5		1.682		8.00	0.095	0.8	
Pipe: 6	8.00	27.5	Disch			8.00	120	0.5	
1011	16.0	11.7	1009	1.500	----	0.00		0.2	
1010	16.4	39.2		1.682		8.00	0.045	0.4	
Pipe: 7	8.00	27.2	Disch			9.00	120	0.2	
1010	16.4	-15.6		1.500	----	0.00		0.2	
1009	16.8	11.7		1.682		9.00	0.005	0.0	
Pipe: 8	8.00	27.2	Disch			9.30	120	0.1	
1008	16.8	-11.7		1.500	----	0.00		-0.0	
1009	16.8	15.6		1.682		9.30	0.008	0.1	
Pipe: 9	8.00	27.3	Disch			9.00	120	0.7	
1007	16.4	15.6	1009	1.500	----	0.00		0.2	
1008	16.8	42.9		1.682		9.00	0.053	0.5	
Pipe: 10	8.00	27.7	Disch			11.75	120	6.1	
113	14.0	58.5	1002	1.500	E: 4.9	14.85		0.9	
1001	16.0	86.2		1.682	T: 9.9	26.60	0.195	5.2	
Pipe: 11	8.00	28.1	Disch			19.75	120	5.7	
114	14.0	42.9	1008	1.500	E: 4.9	14.85		1.0	
1007	16.4	71.0		1.682	T: 9.9	34.60	0.136	4.7	
Pipe: 12	8.00	27.2	Disch			11.20	120	4.7	
101	14.0	46.5	1005	1.500	E: 4.9	14.85		0.9	
1006	16.0	73.6		1.682	T: 9.9	26.05	0.145	3.8	
Pipe: 13	8.00	28.1	Disch			11.20	120	4.1	
102	14.0	39.2	1010	1.500	E: 4.9	14.85		0.9	
1011	16.0	67.3		1.682	T: 9.9	26.05	0.123	3.2	

DATE: 2/10/2022 TIONS\01-HYDRAULIC\4632-PROVAC-HYDRAULIC CALCS - AREA1.SDF

JOB TITLE:

Pipe Tag	K-fac	Add Fl	Add Fl To	Fit:	L	C	(Pt)	
Frm Node	PT	(q)	Node/	Eq.Ln.	F	Pf/ft.	(Pe)	Notes
To Node	PT	Tot.(Q)	Disch	Act ID	T		(Pf)	
Pipe: 14	0.0	0.0			15.75	120	0.2	
102	14.0	16.4	73.6	1006	2.500	----	0.00	-0.0
101	14.0	16.2	73.6		2.682	15.75	0.015	0.2
Pipe: 15	0.0	73.6	101		12.30	120	0.6	
103	14.0	17.0	67.3	1011	2.500	----	0.00	-0.0
102	14.0	16.4	140.9		2.682	12.30	0.050	0.6
Pipe: 16	0.0	140.9	102		13.51	120	0.5	
104	14.0	17.6	-18.7	115	2.500	----	0.00	-0.0
103	14.0	17.0	122.2		2.682	13.51	0.038	0.5
Pipe: 17	0.0	122.2	103		12.51	120	0.4	
105	14.0	17.9	-14.6	116	2.500	----	0.00	-0.0
104	14.0	17.6	107.6		2.682	12.51	0.030	0.4
Pipe: 18	0.0	107.6	104		13.88	120	0.3	
106	14.0	18.3	-11.3	117	2.500	----	0.00	-0.0
105	14.0	17.9	96.4		2.682	13.88	0.025	0.3
Pipe: 19	0.0	96.4	105		13.40	120	0.3	
107	14.0	18.6	-8.1	118	2.500	----	0.00	-0.0
106	14.0	18.3	88.3		2.682	13.40	0.021	0.3
Pipe: 20	0.0	88.3	106		12.88	120	0.2	
108	14.0	18.8	-5.1	119	2.500	----	0.00	-0.0
107	14.0	18.6	83.2		2.682	12.88	0.019	0.2
Pipe: 21	0.0	83.2	107		12.88	120	0.2	
109	14.0	19.0	-0.9	120	2.500	----	0.00	-0.0
108	14.0	18.8	82.3		2.682	12.88	0.018	0.2
Pipe: 22	0.0	4.7	121		12.88	120	0.3	
110	14.0	19.3	82.3	108	2.500	----	0.00	-0.0
109	14.0	19.0	87.0		2.682	12.88	0.020	0.3
Pipe: 23	0.0	0.0			15.75	120	0.0	
114	14.0	18.1	86.2	1001	4.000	----	0.00	-0.0
113	14.0	18.0	86.2		4.260	15.75	0.002	0.0
Pipe: 24	0.0	86.2	113		12.30	120	0.1	
115	14.0	18.2	71.0	1007	4.000	----	0.00	-0.0
114	14.0	18.1	157.2		4.260	12.30	0.006	0.1
Pipe: 25	0.0	18.7	103		13.51	120	0.1	
116	14.0	18.3	157.2	114	4.000	----	0.00	-0.0
115	14.0	18.2	175.9		4.260	13.51	0.008	0.1
Pipe: 26	0.0	14.6	104		12.51	120	0.1	
117	14.0	18.4	175.9	115	4.000	----	0.00	-0.0
116	14.0	18.3	190.5		4.260	12.51	0.009	0.1

DATE: 2/10/2022 TIONS\01-HYDRAULIC\4632-PROVAC-HYDRAULIC CALCS - AREA1.SDF

JOB TITLE:

Pipe Tag	K-fac	Add Fl	Add Fl To	Fit:	L	C	(Pt)		
Frm Node	El (ft)	PT	Node/	Eq.Ln.	F	Pf/ft.	(Pe)		Notes
To Node	El (ft)	PT	Tot.(Q) Disch	Act ID	(ft.)	T	(Pf)		
Pipe: 27		0.0	11.3	105		13.88	120	0.1	
118	14.0	18.5	190.5	116	4.000	0.00	-0.0		
117	14.0	18.4	201.8		4.260	13.88	0.010	0.1	
Pipe: 28		0.0	8.1	106		13.40	120	0.1	
119	14.0	18.7	201.8	117	4.000	0.00	-0.0		
118	14.0	18.5	209.8		4.260	13.40	0.011	0.1	
Pipe: 29		0.0	5.1	107		12.88	120	0.1	
120	14.0	18.8	209.8	118	4.000	0.00	-0.0		
119	14.0	18.7	214.9		4.260	12.88	0.011	0.1	
Pipe: 30		0.0	0.9	108		12.88	120	0.1	
121	14.0	19.0	214.9	119	4.000	0.00	-0.0		
120	14.0	18.8	215.8		4.260	12.88	0.012	0.1	
Pipe: 31		0.0	215.8	120		12.88	120	0.1	
122	14.0	19.1	-4.7	109	4.000	0.00	-0.0		
121	14.0	19.0	211.2		4.260	12.88	0.011	0.1	
Pipe: 32		0.0	140.9	102		66.60	120	1.1	
115	14.0	18.2	-122.2	104	1.500 2E: 9.9	29.70	-0.0		
103	14.0	17.0	18.7		1.682 2T:19.8	96.30	0.012	1.1	
Pipe: 33		0.0	122.2	103		66.60	120	0.7	
116	14.0	18.3	-107.6	105	1.500 2E: 9.9	29.70	-0.0		
104	14.0	17.6	14.6		1.682 2T:19.8	96.30	0.007	0.7	
Pipe: 34		0.0	107.6	104		66.60	120	0.4	
117	14.0	18.4	-96.4	106	1.500 2E: 9.9	29.70	-0.0		
105	14.0	17.9	11.3		1.682 2T:19.8	96.30	0.005	0.4	
Pipe: 35		0.0	96.4	105		66.60	120	0.2	
118	14.0	18.5	-88.3	107	1.500 2E: 9.9	29.70	-0.0		
106	14.0	18.3	8.1		1.682 2T:19.8	96.30	0.002	0.2	
Pipe: 36		0.0	88.3	106		66.60	120	0.1	
119	14.0	18.7	-83.2	108	1.500 2E: 9.9	29.70	-0.0		
107	14.0	18.6	5.1		1.682 2T:19.8	96.30	0.001	0.1	
Pipe: 37		0.0	83.2	107		66.60	120	0.0	
120	14.0	18.8	-82.3	109	1.500 2E: 9.9	29.70	-0.0		
108	14.0	18.8	0.9		1.682 2T:19.8	96.30	0.000	0.0	
Pipe: 38		0.0	215.8	120		66.60	120	0.1	
109	14.0	19.0	-211.2	122	1.500 2E: 9.9	29.70	-0.0		
121	14.0	19.0	4.7		1.682 2T:19.8	96.30	0.001	0.1	
Pipe: 39		0.0	211.2	121		66.60	120	0.2	
110	14.0	19.3	-203.6	123	1.500 2E: 9.9	29.70	-0.0		
122	14.0	19.1	7.5		1.682 2T:19.8	96.30	0.002	0.2	

JOB TITLE:

Pipe Tag	K-fac	Add F1	Add F1	To	Fit:	L	C	(Pt)	
Frm Node	El (ft)	PT	(q)	Node/	Nom ID	Eq.Ln.	F	(Pe)	Notes
To Node	El (ft)	PT	Tot.(Q)	Disch	Act ID	(ft.)	T	Pf/ft.	(Pf)
Pipe: 39A		0.0	211.2	121			12.38	120	0.1
123	14.0	19.2	-7.5	110	4.000	----	0.00		-0.0
122	14.0	19.1	203.6		4.260		12.38	0.010	0.1
Pipe: 39B		0.0	7.5	122			12.38	120	0.0
111	14.0	19.3	87.0	109	4.000	----	0.00		-0.0
110	14.0	19.3	94.5		4.260		12.38	0.002	0.0
Pipe: 39C		0.0	203.6	122			66.60	120	0.1
111	14.0	19.3	-199.9	124	1.250	2E: 7.4	22.30		-0.0
123	14.0	19.2	3.7		1.442	2T:14.9	88.90	0.001	0.1
Pipe: 39D		0.0	203.6	122			34.70	120	0.7
124	14.0	20.0	-3.7	111	4.000	E:13.2	39.50		-0.0
123	14.0	19.2	199.9		4.260	T:26.3	74.20	0.010	0.7
Pipe: 39E		0.0	3.7	123			16.00	120	0.4
112	14.0	19.8	94.5	110	2.500	----	0.00		-0.0
111	14.0	19.3	98.2		2.635		16.00	0.028	0.4
Pipe: 39F		0.0	0.0				43.80	120	0.2
124	14.0	20.0	98.2	111	4.000	2E:26.3	26.33		-0.0
112	14.0	19.8	98.2		4.260		70.13	0.003	0.2
Pipe: 40		0.0	98.2	112		5.0	43.00	120	4.0
601	7.0	24.0	199.9	123	4.000		5.00		3.0
124	14.0	20.0	298.1		4.260		48.00	0.021	1.0
Pipe: 41		0.0	0.0				19.00	120	1.5
TOR	7.0	25.5	298.1	124	4.000	4E:52.7	52.67		-0.0
601	7.0	24.0	298.1		4.260		71.67	0.021	1.5
Pipe: 42		0.0	0.0				6.00	120	2.1
BF2	3.0	27.6	298.1	601	4.000	E:13.2	13.17		1.7
TOR	7.0	25.5	298.1		4.260		19.17	0.021	0.4
Pipe: 43			0.0		Fixed Pressure Loss Device				
BF1	3.0	34.1	298.1	TOR		6.5 psi,	298.1 gpm		
BF2	3.0	27.6	298.1						
Pipe: 44		0.0	0.0				5.00	120	1.4
BOR	0.0	35.5	298.1	BF2	6.000	E:17.6	17.60		1.3
BF1	3.0	34.1	298.1		6.357		22.60	0.003	0.1
Pipe: 45		Source	0.0				114.00	140	1.8
SRC	-3.0	37.3	298.2	BF1	6.000	4E:88.0	93.00		1.3
BOR	0.0	35.5	298.2		6.280	G: 5.0	207.00	0.002	0.5 0.000000

FIRE SPRINKLERS INC.
1524 45th St E, SUITE 102
SUMNER, WA 98390

HYDRAULIC CALCULATIONS

FOR

PRO-VAC
2511 INTER AVE
PUYALLUP, WA 98372

REMOTE AREA 2

FILE NUMBER: 4632
DATE: 02/10/2022

-DESIGN DATA-

OCCUPANCY CLASSIFICATION:	NFPA 13
DENSITY:	.1 gpm/sq. ft.
AREA OF APPLICATION:	923.4 sq. ft.
COVERAGE PER SPRINKLER:	225 sq. ft.
NUMBER OF SPRINKLERS CALCULATED:	13 sprinklers
TOTAL SPRINKLER WATER FLOW REQUIRED:	228.1 gpm
TOTAL WATER REQUIRED (including hose):	328.1 gpm
FLOW AND PRESSURE (@ BOR):	228.1 gpm @BOR 34.0 psi
SPRINKLER ORIFICE SIZE:	5.6=K
SPRINKLER TYPE:	Vk305
SPRINKLER TEMP:	155°
NAME OF CONTRACTOR:	FIRE SPRINKLERS INC
DESIGN/LAYOUT BY:	H. BAUMANN
AUTHORITY HAVING JURISDICTION:	CITY OF PUYALLUP
CONTRACTOR CERTIFICATION NUMBER:	FIRESI*988RJ

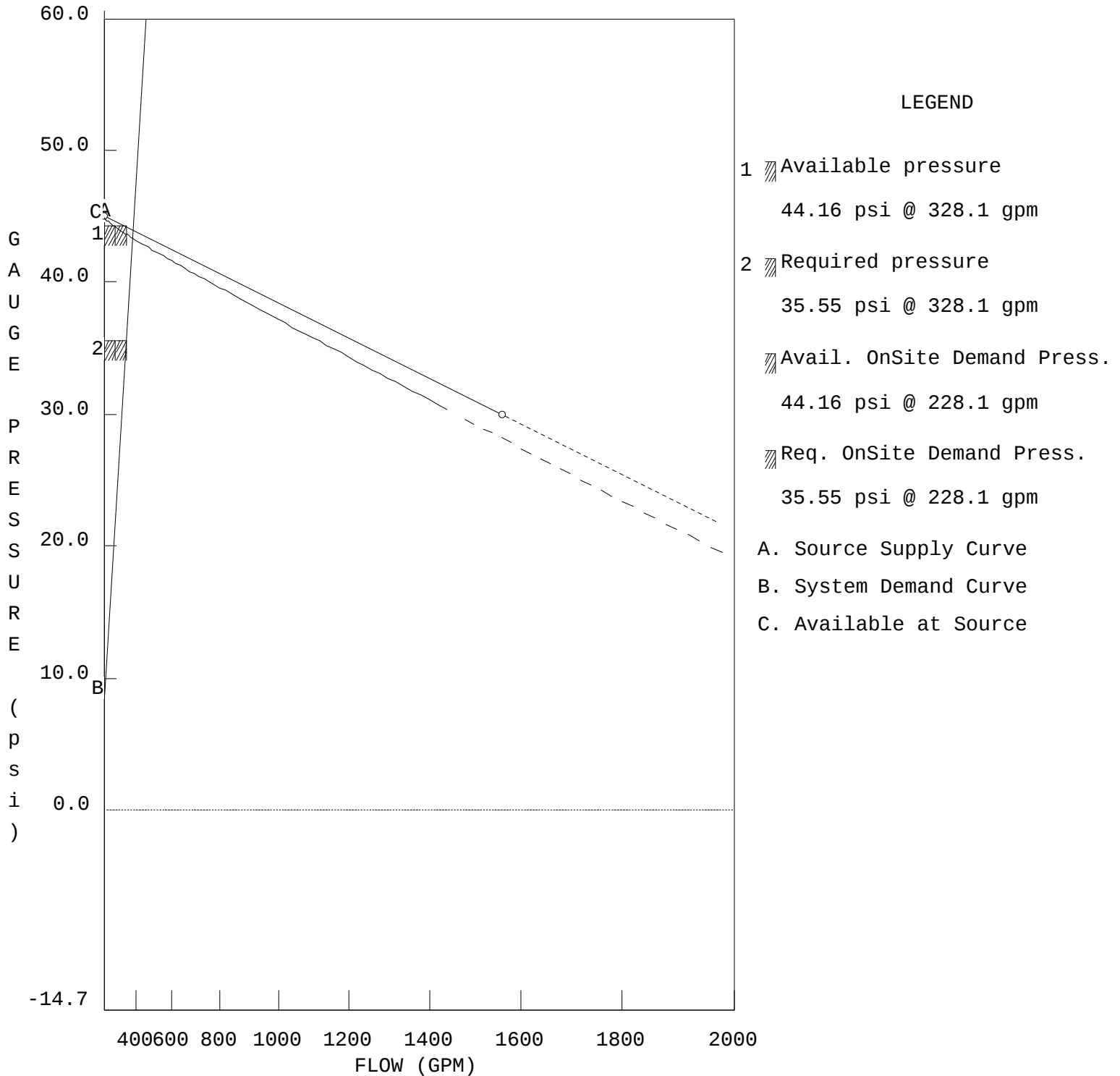
CALCULATIONS BY HASS COMPUTER PROGRAM (LICENSE # 38011601)
HRS SYSTEMS, INC.

DATE: 2/10/2022 TIONS\01-HYDRAULIC\4632-PROVAC-HYDRAULIC CALCS - AREA2.SDF

JOB TITLE:

WATER SUPPLY ANALYSIS

Static: 45.00 psi Resid: 30.00 psi Flow: 1560.0 gpm



Note: (1) Dashed Lines indicate extrapolated values from Test Results

(2) On Site pressures are based on hose stream deduction at the source

DATE: 2/10/2022 TIONS\01-HYDRAULIC\4632-PROVAC-HYDRAULIC CALCS - AREA2.SDF

JOB TITLE:

NFPA WATER SUPPLY DATA

SOURCE NODE TAG	STATIC PRESS. (PSI)	RESID. PRESS. (PSI)	FLOW @ (GPM)	AVAIL. PRESS. (PSI)	TOTAL @ DEMAND (GPM)	REQ'D PRESS. (PSI)
SRC	45.0	30.0	1560.0	44.2	328.1	35.6

AGGREGATE FLOW ANALYSIS:

TOTAL FLOW AT SOURCE	328.1 GPM
TOTAL HOSE STREAM ALLOWANCE AT SOURCE	100.0 GPM
OTHER HOSE STREAM ALLOWANCES	0.0 GPM
TOTAL DISCHARGE FROM ACTIVE SPRINKLERS	228.1 GPM

NODE ANALYSIS DATA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)	NOTES
2001	15.9	K= 5.60	8.8	16.6	
2002	15.9	K= 5.60	9.7	17.5	
2003	15.9	K= 5.60	7.7	15.6	
2004	15.9	K= 5.60	8.2	16.0	
2005	15.9	K= 5.60	7.7	15.5	
2006	15.9	K= 5.60	7.5	15.3	
2007	16.0	K= 5.60	7.2	15.0	
2011	16.0	K= 5.60	10.7	18.3	
2009	16.0	K= 5.60	10.9	18.5	
2010	16.0	K= 5.60	10.6	18.2	
2008	15.5	K= 5.60	13.7	20.8	
2013	16.4	K= 5.60	13.1	20.3	
2012	15.5	K= 5.60	13.6	20.6	
203	15.9	- - - -	9.3	- - -	
202	15.9	- - - -	8.3	- - -	
201	15.9	- - - -	8.0	- - -	
200	15.9	- - - -	7.9	- - -	
204	14.0	- - - -	18.0	- - -	
205	14.0	- - - -	18.1	- - -	
206	14.0	- - - -	18.4	- - -	
601	7.0	- - - -	23.2	- - -	
TOR	7.0	- - - -	24.1	- - -	
BF2	3.0	- - - -	26.1	- - -	
BF1	3.0	- - - -	32.6	- - -	
BOR	0.0	- - - -	34.0	- - -	
SRC	-3.0	SOURCE	35.6	228.1	

DATE: 2/10/2022 TIONS\01-HYDRAULIC\4632-PROVAC-HYDRAULIC CALCS - AREA2.SDF

JOB TITLE:

NFPA PIPE DATA

Pipe Tag	K-fac	Add Fl	Add Fl To	Fit:	L	C	(Pt)	
Frm Node	PT	(q)	Node/	Eq.Ln.	F	Pf/ft.	(Pe)	Notes
To Node	PT	Tot.(Q)	Disch	Act ID	(ft.)	T	(Pf)	
Pipe: 1a	5.60	15.3	Disch		2.0	0.50	120	0.2
2005	15.9	7.7		1.000		2.00		-0.0
2006	15.9	7.5		1.049		2.50	0.079	0.2
Pipe: 2a	5.60	15.5	Disch			9.38	120	0.3
200	15.9	7.9		1.500	----	0.00		-0.0
2005	15.9	7.7		1.682		9.38	0.029	0.3
Pipe: 3a	5.60	15.0	Disch			4.00	120	0.7
200	15.9	7.9		1.000	T: 5.0	5.00		0.0
2007	16.0	7.2		1.049		9.00	0.077	0.7
Pipe: 4a	0.0	30.8	2005			1.92	120	0.1
201	15.9	8.0	2007	1.500	----	0.00		-0.0
200	15.9	7.9		1.682		1.92	0.061	0.1
Pipe: 5a	0.0	0.0				1.79	120	0.1
2004	15.9	8.2	200	1.500	----	0.00		-0.0
201	15.9	8.0		1.682		1.79	0.061	0.1
Pipe: 6a	5.60	16.0	Disch			1.00	120	0.1
202	15.9	8.3	201	1.500	----	0.00		-0.0
2004	15.9	8.2		1.682		1.00	0.105	0.1
Pipe: 7a	5.60	15.6	Disch			1.60	120	0.5
202	15.9	8.3		1.000	T: 5.0	5.00		-0.0
2003	15.9	7.7		1.049		6.60	0.082	0.5
Pipe: 8a	0.0	61.8	2004			6.33	120	1.0
203	15.9	9.3	2003	1.500	----	0.00		-0.0
202	15.9	8.3		1.682		6.33	0.160	1.0
Pipe: 9a	5.60	16.6	Disch			0.60	120	0.5
203	15.9	9.3		1.000	T: 5.0	5.00		-0.0
2001	15.9	8.8		1.049		5.60	0.092	0.5
Pipe: 10a	0.0	77.4	202			2.00	120	0.5
2002	15.9	9.7	2001	1.500	----	0.00		-0.0
203	15.9	9.3		1.682		2.00	0.228	0.5
Pipe: 11a	5.60	17.5	Disch			9.00	120	8.3
204	14.0	18.0	203	1.500	E: 4.9	14.85		0.8
2002	15.9	9.7		1.682	T: 9.9	23.85	0.313	7.5
Pipe: 1b	5.60	18.3	Disch			9.83	120	0.2
2009	16.0	10.9		1.500	E: 4.9	4.95		-0.0
2011	16.0	10.7		1.682		14.78	0.011	0.2
Pipe: 2b	5.60	18.2	Disch			0.50	120	0.3
2009	16.0	10.9		1.000	E: 2.0	2.00		-0.0
2010	16.0	10.6		1.049		2.50	0.110	0.3

JOB TITLE:

Pipe Tag From Node To Node	El (ft) El (ft)	K-fac PT PT	Add Fl (q) Tot.(Q)	Add Fl Node/ Disch	To Nom ID Act ID	Fit: Eq.Ln. (ft.)	L F T	C Pf/ft.	(Pt) (Pe) (Pf)	Notes
Pipe: 3b 2008 2009	15.5 16.0	5.60 13.7 10.9	18.5 36.6 55.0	Disch	1.500 1.682	4E:19.8	11.50 19.80 31.30	120 0.085	2.9 0.2 2.7	
Pipe: 4b 205 2008	14.0 15.5	5.60 18.1 13.7	20.8 55.0 75.8	Disch 2009	1.500 1.682	E: 4.9 T: 9.9	9.00 14.85 23.85	120 0.153	4.3 0.6 3.7	
Pipe: 1c 2012 2013	15.5 16.4	5.60 13.6 13.1	20.3 0.0 20.3	Disch	1.500 1.682	----	1.10 0.00 1.10	120 0.013	0.4 0.4 0.0	
Pipe: 2c 206 2012	14.0 15.5	5.60 18.4 13.6	20.6 20.3 40.9	Disch	1.500 1.682	6E:29.7	56.20 29.70 85.90	120 0.049	4.9 0.6 4.2	
Pipe: 1d 205 204	14.0 14.0	0.0 18.1 18.0	0.0 111.4 111.4	2002	4.000 4.260	----	9.67 0.00 9.67	120 0.003	0.0 -0.0 0.0	
Pipe: 2d 206 205	14.0 14.0	0.0 18.4 18.1	111.4 75.8 187.2	204 2008	4.000 4.260	2E:26.3	14.50 26.33 40.83	120 0.009	0.4 -0.0 0.4	
Pipe: 3d 601 206	7.0 14.0	0.0 23.2 18.4	187.2 40.9 228.1	205 2012	4.000 4.260	5E:65.8 T:26.3	46.70 92.17 138.87	120 0.013	4.8 3.0 1.8	
Pipe: 4d TOR 601	7.0 7.0	0.0 24.1 23.2	0.0 228.1 228.1	206	4.000 4.260	4E:52.7	19.00 52.67 71.67	120 0.013	0.9 -0.0 0.9	
Pipe: 5d BF2 TOR	3.0 7.0	0.0 26.1 24.1	0.0 228.1 228.1	601	4.000 4.260	E:13.2	6.00 13.17 19.17	120 0.013	2.0 1.7 0.2	
Pipe: 6d BF1 BF2	3.0 3.0	0.0 32.6 26.1	0.0 228.1 228.1	TOR	Fixed Pressure Loss Device 6.5 psi, 228.1 gpm					
Pipe: 7d BOR BF1	0.0 3.0	0.0 34.0 32.6	0.0 228.1 228.1	BF2	6.000 6.357	E:17.6	5.00 17.60 22.60	120 0.002	1.3 1.3 0.0	
Pipe: 8d SRC BOR	-3.0 0.0	Source 35.6 34.0	0.0 228.1 228.1	BF1	6.000 6.280	4E:88.0 G: 5.0	114.00 93.00 207.00	140 0.001	1.6 1.3 0.3	0.000000

DATE: 2/10/2022 TIONS\01-HYDRAULIC\4632-PROVAC-HYDRAULIC CALCS - AREA2.SDF

JOB TITLE:

NOTES (HASS):

- (1) Calculations were performed by the HASS 2021 D computer program in accordance with NFPA13 (2020) under license no. 64839935 granted by
HRS Systems, Inc.
208 Southside Square
Petersburg, TN 37144
(931) 659-9760
- (2) The system has been calculated to provide an average imbalance at each node of 0.004 gpm and a maximum imbalance at any node of 0.104 gpm.
- (3) Total pressure at each node is used in balancing the system. Maximum water velocity is 16.1 ft/sec at pipe 11a.
- (4) Items listed in bold print on the cover sheet

are automatically transferred from the calculation report.
- (5) Available pressure at source node SRC under full flow conditions is 43.94 psi with a flow of 371.94 gpm.

(6) PIPE FITTINGS TABLE

HASS Pipe Table Name: standard

PAGE: A	MATERIAL: S40		HWC: 120						
Diameter	Equivalent Fitting Lengths in Feet								
(in)	E	T	L	C	B	G	A	D	N
	Ell	Tee	LngEll	ChkVlv	BfyVlv	GatVlv	AlmChk	DPVlv	NTee

	F								
	F45Ell								
1.049	2.00	5.00	2.00	5.00	6.00	1.00	10.00	2.00	5.00
	1.00								

PAGE: D	MATERIAL: DIRON		HWC: 140						
Diameter	Equivalent Fitting Lengths in Feet								
(in)	E	T	L	C	B	G	N	F	
	Ell	Tee	LngEll	ChkVlv	BfyVlv	GatVlv	NPTee	F45Ell	
6.280	22.00	47.00	14.00	51.00	16.00	5.00	47.00	11.00	

PAGE: *	MATERIAL: S40		HWC: 120						
Diameter	Equivalent Fitting Lengths in Feet								
(in)	E	T	L	C	B	G	A	D	N
	Ell	Tee	LngEll	ChkVlv	BfyVlv	GatVlv	AlmChk	DPVlv	NPTee

	F								
	F45Ell								
1.682	4.95	9.90	2.47	11.14	7.42	1.24	12.37	12.37	9.90
	2.47								
4.260	13.17	26.33	7.90	28.97	15.80	2.63	26.33	26.33	26.33
	6.58								
6.357	17.60	37.72	11.32	40.23	12.57	3.77	35.21	35.21	37.72

DATE: 2/10/2022 TIONS\01-HYDRAULIC\4632-PROVAC-HYDRAULIC CALCS - AREA2.SDF

JOB TITLE:

8.80

FIRE SPRINKLERS INC.
1524 45th St E, SUITE 102
SUMNER, WA 98390

HYDRAULIC CALCULATIONS

FOR

PRO-VAC
2511 INTER AVE
PUYALLUP, WA 98372

REMOTE AREA 3

FILE NUMBER: 4632
DATE: 02/10/2022

-DESIGN DATA-

OCCUPANCY CLASSIFICATION:	NFPA 13
DENSITY:	.1 gpm/sq. ft.
AREA OF APPLICATION:	904 sq. ft.
COVERAGE PER SPRINKLER:	225 sq. ft.
NUMBER OF SPRINKLERS CALCULATED:	19 sprinklers
TOTAL SPRINKLER WATER FLOW REQUIRED:	196.1 gpm
TOTAL WATER REQUIRED (including hose):	296.1 gpm
FLOW AND PRESSURE (@ BOR):	196.1 gpm @ 32.7 psi
SPRINKLER ORIFICE SIZE:	5.6=K
SPRINKLER TYPE:	Vk305
SPRINKLER TEMP:	155°
NAME OF CONTRACTOR:	FIRE SPRINKLERS INC
DESIGN/LAYOUT BY:	H. BAUMANN
AUTHORITY HAVING JURISDICTION:	CITY OF PUYALLUP
CONTRACTOR CERTIFICATION NUMBER:	FIRESI*988RJ

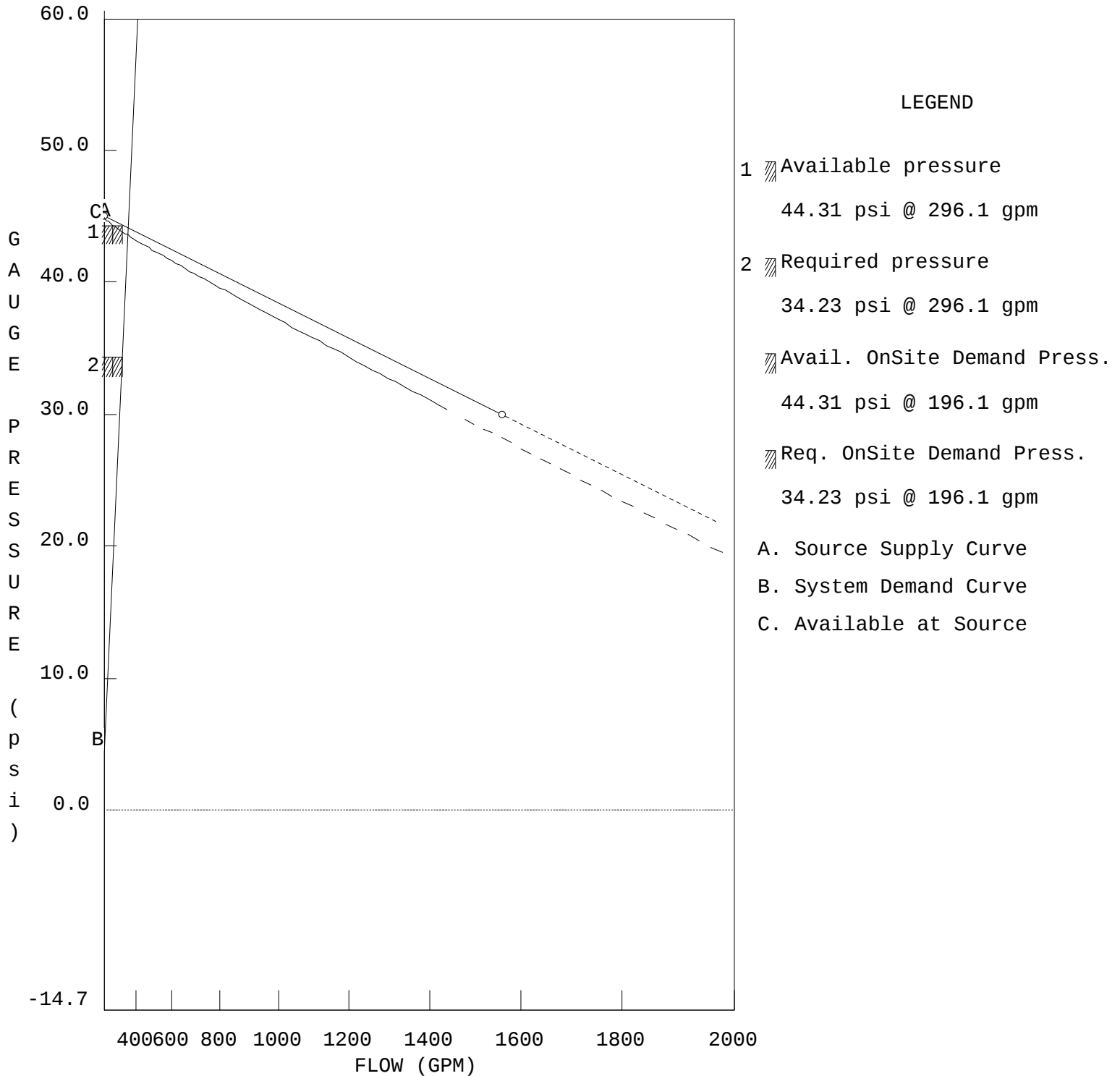
CALCULATIONS BY HASS COMPUTER PROGRAM (LICENSE # 38011601)
HRS SYSTEMS, INC.

DATE: 2/10/2022 LATIONS\01-HYDRAULIC\4632-PROVAC-HYDRAULIC CALCS-AREA3.SDF

JOB TITLE:

WATER SUPPLY ANALYSIS

Static: 45.00 psi Resid: 30.00 psi Flow: 1560.0 gpm



Note: (1) Dashed Lines indicate extrapolated values from Test Results

(2) On Site pressures are based on hose stream deduction at the source

DATE: 2/10/2022 LATIONS\01-HYDRAULIC\4632-PROVAC-HYDRAULIC CALCS-AREA3.SDF

JOB TITLE:

NFPA WATER SUPPLY DATA

SOURCE NODE TAG	STATIC PRESS. (PSI)	RESID. PRESS. (PSI)	FLOW @ (GPM)	AVAIL. PRESS. (PSI)	TOTAL @ DEMAND (GPM)	REQ'D PRESS. (PSI)
SRC	45.0	30.0	1560.0	44.3	296.1	34.2

AGGREGATE FLOW ANALYSIS:

TOTAL FLOW AT SOURCE	296.1 GPM
TOTAL HOSE STREAM ALLOWANCE AT SOURCE	100.0 GPM
OTHER HOSE STREAM ALLOWANCES	0.0 GPM
TOTAL DISCHARGE FROM ACTIVE SPRINKLERS	196.1 GPM

NODE ANALYSIS DATA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)	AREA (FT^2)	DENSITY		NOTES
						REQ.	ACT.	
						(GPM/FT^2)		
3009	7.5	K= 5.60	18.8	24.3	58.0	0.100	0.419	
3008	7.5	K= 5.60	19.5	24.8	79.0	0.100	0.313	
3007	7.5	K= 5.60	18.3	24.0	100.0	0.100	0.240	
3006	7.5	K= 5.60	17.6	23.5	125.0	0.100	0.188	
3005	7.5	K= 5.60	13.5	20.6	77.0	0.100	0.267	
3004	7.5	K= 5.60	12.8	20.0	161.0	0.100	0.125	
3003	7.5	K= 5.60	12.8	20.0	77.0	0.100	0.260	
3002	7.5	K= 5.60	11.8	19.2	192.0	0.100	0.100	
3001	7.5	K= 5.60	12.4	19.7	130.0	0.100	0.152	
301	7.5	- - - -	12.4	- - -	- - -	- - -	- - -	
302	7.5	- - - -	13.5	- - -	- - -	- - -	- - -	
303	7.5	- - - -	14.6	- - -	- - -	- - -	- - -	
304	7.5	- - - -	18.6	- - -	- - -	- - -	- - -	
305	7.5	- - - -	19.3	- - -	- - -	- - -	- - -	
201	15.9	- - - -	14.9	- - -	- - -	- - -	- - -	
204	14.0	- - - -	18.5	- - -	- - -	- - -	- - -	
124	14.0	- - - -	18.8	- - -	- - -	- - -	- - -	
403	7.0	- - - -	21.6	- - -	- - -	- - -	- - -	
602	7.0	- - - -	22.3	- - -	- - -	- - -	- - -	
601	7.0	- - - -	22.2	- - -	- - -	- - -	- - -	
TOR	7.0	- - - -	23.0	- - -	- - -	- - -	- - -	
BF2	3.0	- - - -	24.9	- - -	- - -	- - -	- - -	
BF1	3.0	- - - -	31.4	- - -	- - -	- - -	- - -	
BOR	0.0	- - - -	32.7	- - -	- - -	- - -	- - -	
SRC	-3.0	SOURCE	34.2	196.1	- - -	- - -	- - -	

DATE: 2/10/2022 LATIONS\01-HYDRAULIC\4632-PROVAC-HYDRAULIC CALCS-AREA3.SDF

JOB TITLE:

NFPA PIPE DATA

Pipe Tag Frm Node To Node	El (ft) El (ft)	K-fac PT PT	Add Fl (q) Tot.(Q)	Add Fl To Node/ Disch	Nom ID Act ID	Fit: Eq.Ln. (ft.)	L F T	C Pf/ft.	(Pt) (Pe) (Pf)	Notes
Pipe: 1 301 3001	7.5 7.5	5.60 12.4 12.4	19.7 0.0 19.7	Disch	1.500 1.682	----	3.00 0.00 3.00	120 0.013	0.0 -0.0 0.0	
Pipe: 2 301 3002	7.5 7.5	5.60 12.4 11.8	19.2 0.0 19.2	Disch	1.000 1.049	T: 5.0	0.60 5.00 5.60	120 0.121	0.7 -0.0 0.7	
Pipe: 3 3003 301	7.5 7.5	0.0 12.8 12.4	0.0 38.9 38.9		1.500 1.682	----	7.16 0.00 7.16	120 0.045	0.3 -0.0 0.3	
Pipe: 4 303 3003	7.5 7.5	5.60 14.6 12.8	20.0 38.9 58.9	Disch 301	1.500 1.682	E: 4.9 T: 9.9	4.25 14.85 19.10	120 0.096	1.8 -0.0 1.8	
Pipe: 5 302 3005	7.5 7.5	5.60 13.5 13.5	20.6 0.0 20.6	Disch	1.500 1.682	----	2.30 0.00 2.30	120 0.014	0.0 -0.0 0.0	
Pipe: 6 302 3004	7.5 7.5	5.60 13.5 12.8	20.0 0.0 20.0	Disch	1.000 1.049	T: 5.0	0.60 5.00 5.60	120 0.131	0.7 -0.0 0.7	
Pipe: 7 303 302	7.5 7.5	0.0 14.6 13.5	0.0 40.6 40.6		1.500 1.682	E: 4.9 T: 9.9	6.70 14.85 21.55	120 0.048	1.0 -0.0 1.0	
Pipe: 8 201 303	15.9 7.5	0.0 14.9 14.6	40.6 58.9 99.5	302 3003	1.500 1.682	E: 4.9	10.40 4.95 15.35	120 0.254	0.3 -3.6 3.9	
Pipe: 9 204 201	14.0 15.9	0.0 18.5 14.9	0.0 99.5 99.5	303	2.000 2.157	E: 6.2 T:12.3	19.50 18.46 37.96	120 0.076	3.7 0.8 2.9	
Pipe: 10 124 204	14.0 14.0	0.0 18.8 18.5	0.0 99.5 99.5	201	4.000 4.260	2E:26.3 T:26.3	33.92 52.67 86.59	120 0.003	0.2 -0.0 0.2	
Pipe: 11 601 124	7.0 14.0	0.0 22.2 18.8	0.0 99.5 99.5	204	4.000 4.260	6E:79.0	42.00 79.00 121.00	120 0.003	3.4 3.0 0.3	
Pipe: 12 304 3006	7.5 7.5	5.60 18.6 17.6	23.5 0.0 23.5	Disch	1.000 1.049	T: 5.0	0.67 5.00 5.67	120 0.175	1.0 -0.0 1.0	
Pipe: 13 3009 304	7.5 7.5	0.0 18.8 18.6	0.0 23.5 23.5		1.500 1.682	E: 4.9	8.10 4.95 13.05	120 0.018	0.2 -0.0 0.2	

DATE: 2/10/2022 LATIONS\01-HYDRAULIC\4632-PROVAC-HYDRAULIC CALCS-AREA3.SDF

JOB TITLE:

Pipe Tag	K-fac	Add Fl	Add Fl To	Fit:	L	C	(Pt)	
Frm Node	El (ft)	PT	Node/	Eq.Ln.	F	Pf/ft.	(Pe)	Notes
To Node	El (ft)	PT	Tot.(Q) Disch	Act ID	(ft.)	T	(Pf)	
Pipe: 14		5.60	24.3	Disch		24.00	120	2.8
403	7.0	21.6	23.5	304	1.500 E: 4.9	14.85		0.2
3009	7.5	18.8	47.8		1.682 T: 9.9	38.85	0.065	2.5
Pipe: 15		0.0	0.0			58.50	120	0.7
602	7.0	22.3	47.8	3009	2.500 2E:16.5	32.95		-0.0
403	7.0	21.6	47.8		2.635 T:16.5	91.45	0.007	0.7
Pipe: 16		5.60	24.0	Disch		0.42	120	1.0
305	7.5	19.3	0.0		1.000 T: 5.0	5.00		-0.0
3007	7.5	18.3	24.0		1.049	5.42	0.182	1.0
Pipe: 17		0.0	0.0			8.60	120	0.2
3008	7.5	19.5	24.0		1.500 E: 4.9	4.95		-0.0
305	7.5	19.3	24.0		1.682	13.55	0.018	0.2
Pipe: 18		5.60	24.8	Disch		17.00	120	2.7
602	7.0	22.3	24.0	305	1.500 2E: 9.9	19.80		0.2
3008	7.5	19.5	48.7		1.682 T: 9.9	36.80	0.068	2.5
Pipe: 19		0.0	0.0			3.75	120	0.1
602	7.0	22.3	99.5	124	2.500 ----	0.00		-0.0
601	7.0	22.2	99.5		2.635	3.75	0.029	0.1
Pipe: 20		0.0	99.5	601		19.00	120	0.7
TOR	7.0	23.0	47.8	403	4.000 4E:52.7	52.67		-0.0
602	7.0	22.3	196.1		4.260	71.67	0.010	0.7
Pipe: 21		0.0	0.0			6.00	120	1.9
BF2	3.0	24.9	196.1	602	4.000 E:13.2	13.17		1.7
TOR	7.0	23.0	196.1		4.260	19.17	0.010	0.2
Pipe: 22			0.0		Fixed Pressure Loss Device			
BF1	3.0	31.4	196.1	TOR	6.5 psi, 196.1 gpm			
BF2	3.0	24.9	196.1					
Pipe: 23		0.0	0.0			5.00	120	1.3
BOR	0.0	32.7	196.1	BF2	6.000 E:17.6	17.60		1.3
BF1	3.0	31.4	196.1		6.357	22.60	0.001	0.0
Pipe: 24		Source	0.0			114.00	140	1.5
SRC	-3.0	34.2	196.1	BF1	6.000 4E:88.0	93.00		1.3
BOR	0.0	32.7	196.1		6.280 G: 5.0	207.00	0.001	0.2

NOTES (HASS):

- Calculations were performed by the HASS 2021 D computer program in accordance with NFPA13 (2020) under license no. 64839935 granted by HRS Systems, Inc.
208 Southside Square
Petersburg, TN 37144
(931) 659-9760

DATE: 2/10/2022 LATIONS\01-HYDRAULIC\4632-PROVAC-HYDRAULIC CALCS-AREA3.SDF
JOB TITLE:

- (2) The system has been calculated to provide an average imbalance at each node of 0.003 gpm and a maximum imbalance at any node of 0.068 gpm.
- (3) Total pressure at each node is used in balancing the system. Maximum water velocity is 14.4 ft/sec at pipe 8.
- (4) Items listed in bold print on the cover sheet are automatically transferred from the calculation report.
- (5) Available pressure at source node SRC under full flow conditions is 44.13 psi with a flow of 335.28 gpm.

(6) PIPE FITTINGS TABLE

HASS Pipe Table Name: standard

PAGE: A		MATERIAL: S40		HWC: 120						
Diameter (in)	Equivalent Fitting Lengths in Feet									
	E Ell	T Tee	L LngEll	C ChkVlv	B BfyVlv	G GatVlv	A AlmChk	D DPVlv	N NTee	

	F F45Ell									
1.049	2.00	5.00	2.00	5.00	6.00	1.00	10.00	2.00	5.00	
	1.00									

PAGE: D	MATERIAL: DIRON	HWC: 140						
Diameter	Equivalent Fitting Lengths in Feet							
(in)	E	T	L	C	B	G	N	F
	Ell	Tee	LngEll	ChkVlv	BfyVlv	GatVlv	NPTee	F45Ell
6.280	22.00	47.00	14.00	51.00	16.00	5.00	47.00	11.00

PAGE: *		MATERIAL: S40		HWC: 120						
Diameter (in)	Equivalent Fitting Lengths in Feet									
	E Ell	T Tee	L LngEll	C ChkVlv	B BfyVlv	G GatVlv	A AlmChk	D DPVlv	N NPTee	
	F F45Ell									
1.682	4.95 2.47	9.90	2.47	11.14	7.42	1.24	12.37	12.37	9.90	
2.157	6.15 3.08	12.31	3.69	13.54	7.38	1.23	12.31	12.31	12.31	
2.635	8.24 4.12	16.47	5.49	19.22	9.61	1.37	13.73	13.73	16.47	
4.260	13.17 6.58	26.33	7.90	28.97	15.80	2.63	26.33	26.33	26.33	
6.357	17.60 8.80	37.72	11.32	40.23	12.57	3.77	35.21	35.21	37.72	

FIRE SPRINKLERS INC.
1524 45th St E, SUITE 102
SUMNER, WA 98390

HYDRAULIC CALCULATIONS

FOR

PRO-VAC
2511 INTER AVE
PUYALLUP, WA 98372

REMOTE AREA 4

FILE NUMBER: 4632
DATE: 02/10/2022

-DESIGN DATA-

OCCUPANCY CLASSIFICATION:	NFPA 13
DENSITY:	.2 gpm/sq. ft.
AREA OF APPLICATION:	598 sq. ft.
COVERAGE PER SPRINKLER:	130 sq. ft.
NUMBER OF SPRINKLERS CALCULATED:	8 sprinklers
TOTAL SPRINKLER WATER FLOW REQUIRED:	162.1 gpm
TOTAL WATER REQUIRED (including hose):	412.1 gpm
FLOW AND PRESSURE (@ BOR):	162.1 gpm @BOR 36.0 psi
SPRINKLER ORIFICE SIZE:	5.6=K
SPRINKLER TYPE:	Vk302
SPRINKLER TEMP:	155°
NAME OF CONTRACTOR:	FIRE SPRINKLERS INC
DESIGN/LAYOUT BY:	H. BAUMANN
AUTHORITY HAVING JURISDICTION:	CITY OF PUYALLUP
CONTRACTOR CERTIFICATION NUMBER:	FIRESI*988RJ

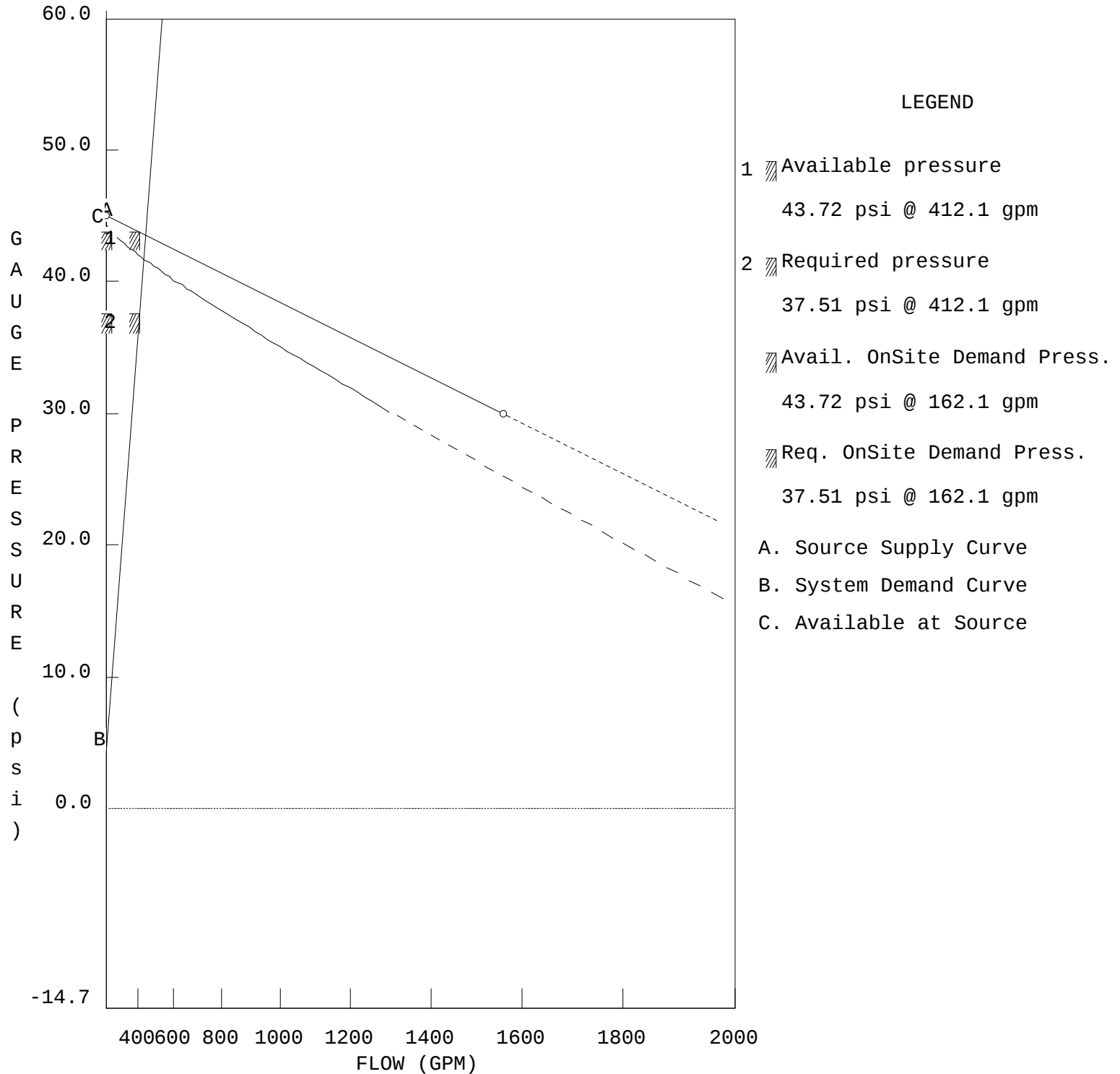
CALCULATIONS BY HASS COMPUTER PROGRAM (LICENSE # 38011601)
HRS SYSTEMS, INC.

DATE: 2/10/2022S\01-HYDRAULIC\4632 - PROVAC - HYDRAULIC CALCS - AREA4.SDF

JOB TITLE:

WATER SUPPLY ANALYSIS

Static: 45.00 psi Resid: 30.00 psi Flow: 1560.0 gpm



Note: (1) Dashed Lines indicate extrapolated values from Test Results

(2) On Site pressures are based on hose stream deduction at the source

DATE: 2/10/2022S\01-HYDRAULIC\4632 - PROVAC - HYDRAULIC CALCS - AREA4.SDF

JOB TITLE:

NFPA WATER SUPPLY DATA

SOURCE NODE TAG	STATIC PRESS. (PSI)	RESID. PRESS. (PSI)	FLOW @ (GPM)	AVAIL. PRESS. (PSI)	TOTAL @ DEMAND (GPM)	REQ'D PRESS. (PSI)
SRC	45.0	30.0	1560.0	43.7	412.1	37.5

AGGREGATE FLOW ANALYSIS:

TOTAL FLOW AT SOURCE	412.1 GPM
TOTAL HOSE STREAM ALLOWANCE AT SOURCE	250.0 GPM
OTHER HOSE STREAM ALLOWANCES	0.0 GPM
TOTAL DISCHARGE FROM ACTIVE SPRINKLERS	162.1 GPM

NODE ANALYSIS DATA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)	NOTES
4001	7.2	K= 5.60	11.1	18.7	
4002	7.2	K= 5.60	12.2	19.6	
4003	7.2	K= 5.60	12.8	20.0	
4004	7.2	K= 5.60	12.9	20.1	
4005	7.2	K= 5.60	13.3	20.4	
4006	7.2	K= 5.60	14.0	20.9	
4007	7.2	K= 5.60	14.1	21.0	
4008	7.2	K= 5.60	14.6	21.4	
400	7.0	- - - -	12.1	- - -	
401	7.0	- - - -	16.1	- - -	
402	7.0	- - - -	16.4	- - -	
403	7.0	- - - -	17.9	- - -	
601	7.0	- - - -	25.9	- - -	
TOR	7.0	- - - -	26.3	- - -	
BF2	3.0	- - - -	28.2	- - -	
BF1	3.0	- - - -	34.7	- - -	
BOR	0.0	- - - -	36.0	- - -	
SRC	-3.0	SOURCE	37.5	162.1	

DATE: 2/10/2022S\01-HYDRAULIC\4632 - PROVAC - HYDRAULIC CALCS - AREA4.SDF

JOB TITLE:

NFPA PIPE DATA

Pipe Tag	K-fac	Add Fl	Add Fl To	Fit:	L	C	(Pt)	
Frm Node	PT	(q)	Node/	Eq.Ln.	F	Pf/ft.	(Pe)	Notes
To Node	PT	Tot.(Q)	Disch	Act ID	(ft.)	T	(Pf)	
Pipe: 1	5.60	18.7	Disch			1.30	120	1.0
400	7.0	0.0		1.000	E: 2.0	7.00		0.1
4001	7.2	18.7		1.049	T: 5.0	8.30	0.114	0.9
Pipe: 2	0.0	0.0				8.50	120	0.1
4002	7.2	18.7		1.500	E: 4.9	4.95		-0.1
400	7.0	18.7		1.682		13.45	0.011	0.2
Pipe: 3	5.60	19.6	Disch			15.50	120	1.1
4005	7.2	18.7	400	1.500	T: 9.9	9.90		-0.0
4002	7.2	38.2		1.682		25.40	0.043	1.1
Pipe: 4	5.60	20.0	Disch			9.00	120	0.1
4004	7.2	0.0		1.500	----	0.00		-0.0
4003	7.2	20.0		1.682		9.00	0.013	0.1
Pipe: 5	5.60	20.1	Disch			9.00	120	0.4
4005	7.2	20.0		1.500	----	0.00		-0.0
4004	7.2	40.1		1.682		9.00	0.047	0.4
Pipe: 6	5.60	20.4	Disch			5.75	120	2.8
401	7.0	38.2	4002	1.500	E: 4.9	4.95		0.1
4005	7.2	98.7		1.682		10.70	0.250	2.7
Pipe: 6A	0.0	0.0				10.50	120	0.3
402	7.0	98.7	4005	2.500	----	0.00		-0.0
401	7.0	98.7		2.635		10.50	0.028	0.3
Pipe: 7	5.60	20.9	Disch			9.00	120	0.1
4007	7.2	0.0		1.500	----	0.00		-0.0
4006	7.2	20.9		1.682		9.00	0.014	0.1
Pipe: 8	5.60	21.0	Disch			9.00	120	0.5
4008	7.2	20.9		1.500	----	0.00		-0.0
4007	7.2	42.0		1.682		9.00	0.051	0.5
Pipe: 9	5.60	21.4	Disch			5.75	120	1.8
402	7.0	42.0	4007	1.500	T: 9.9	9.90		0.1
4008	7.2	63.3		1.682		15.65	0.110	1.7
Pipe: 9A	0.0	63.3	4008			5.00	120	1.5
403	7.0	98.7	401	2.500	T:16.5	16.47		-0.0
402	7.0	162.1		2.635		21.47	0.070	1.5
Pipe: 10	0.0	0.0				64.00	120	8.0
601	7.0	162.1	402	2.500	2E:16.5	49.42		-0.0
403	7.0	162.1		2.635	2T:32.9	113.42	0.070	8.0
Pipe: 11	0.0	0.0				19.00	120	0.5
TOR	7.0	162.1	403	4.000	4E:52.7	52.67		-0.0
601	7.0	162.1		4.260		71.67	0.007	0.5

DATE: 2/10/2022S\01-HYDRAULIC\4632 - PROVAC - HYDRAULIC CALCS - AREA4.SDF

JOB TITLE:

Pipe Tag	K-fac	Add Fl	Add Fl To	Fit:	L	C	(Pt)	
Frm Node	El (ft)	PT	Node/	Eq.Ln.	F		(Pe)	Notes
To Node	El (ft)	PT	Tot.(Q) Disch	Act ID	(ft.)	T	Pf/ft.	(Pf)
Pipe: 12		0.0	0.0			6.00	120	1.9
BF2	3.0	28.2	162.1	601	4.000	E:13.2	13.17	1.7
TOR	7.0	26.3	162.1		4.260		19.17	0.007
Pipe: 13		0.0						
BF1	3.0	34.7	162.1	TOR				
BF2	3.0	28.2	162.1					
Pipe: 14		0.0	0.0			5.00	120	1.3
BOR	0.0	36.0	162.1	BF2	6.000	E:17.6	17.60	1.3
BF1	3.0	34.7	162.1		6.357		22.60	0.001
Pipe: 15		Source	0.0			114.00	120	1.5
SRC	-3.0	37.5	162.1	BF1	6.000	4E:66.4	69.91	1.3
BOR	0.0	36.0	162.1		6.280	G: 3.6	183.91	0.001

NOTES (HASS):

- (1) Calculations were performed by the HASS 2021 D computer program in accordance with NFPA13 (2020) under license no. 64839935 granted by

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

- (2) The system has been calculated to provide an average imbalance at each node of 0.004 gpm and a maximum imbalance at any node of 0.061 gpm.

- (3) Total pressure at each node is used in balancing the system. Maximum water velocity is 14.3 ft/sec at pipe 6.

- (4) Items listed in bold print on the cover sheet

are automatically transferred from the calculation report.

- (5) Available pressure at source node SRC under full flow conditions is 43.61 psi with a flow of 430.42 gpm.

- (6) PIPE FITTINGS TABLE

HASS Pipe Table Name: standard

DATE: 2/10/2022S\01-HYDRAULIC\4632 - PROVAC - HYDRAULIC CALCS - AREA4.SDF
JOB TITLE:

PAGE: A MATERIAL: S40 HWC: 120

Diameter (in)	Equivalent Fitting Lengths in Feet								
	E Ell	T Tee	L LngEll	C ChkVlv	B BfyVlv	G GatVlv	A AlmChk	D DPVlv	N NTee

	F F45Ell								
1.049	2.00	5.00	2.00	5.00	6.00	1.00	10.00	2.00	5.00
	1.00								

PAGE: * MATERIAL: S40 HWC: 120

Diameter (in)	Equivalent Fitting Lengths in Feet								
	E Ell	T Tee	L LngEll	C ChkVlv	B BfyVlv	G GatVlv	A AlmChk	D DPVlv	N NPTee

	F F45Ell								
1.682	4.95	9.90	2.47	11.14	7.42	1.24	12.37	12.37	9.90
	2.47								
2.635	8.24	16.47	5.49	19.22	9.61	1.37	13.73	13.73	16.47
	4.12								
4.260	13.17	26.33	7.90	28.97	15.80	2.63	26.33	26.33	26.33
	6.58								
6.280	16.59	35.55	10.66	37.92	11.85	3.55	33.18	33.18	35.55
	8.29								
6.357	17.60	37.72	11.32	40.23	12.57	3.77	35.21	35.21	37.72
	8.80								

SECTION B

SEISMIC CALCULATIONS



2511 Inter Ave, Puyallup, WA 98372, USA

Latitude, Longitude: 47.19006599999999, -122.2614557



Date 12/6/2021, 7:50:47 AM

Design Code Reference Document

IBC-2015

Risk Category

II

Site Class

A - Hard Rock

Type	Value	Description
S_S	1.245	MCE_R ground motion. (for 0.2 second period)
S_1	0.477	MCE_R ground motion. (for 1.0s period)
S_{MS}	0.996	Site-modified spectral acceleration value
S_{M1}	0.382	Site-modified spectral acceleration value
S_{DS}	0.664	Numeric seismic design value at 0.2 second SA
S_{D1}	0.255	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	D	Seismic design category
F_a	0.8	Site amplification factor at 0.2 second
F_v	0.8	Site amplification factor at 1.0 second
PGA	0.506	MCE_G peak ground acceleration
F_{PGA}	0.8	Site amplification factor at PGA
PGA_M	0.405	Site modified peak ground acceleration
T_L	6	Long-period transition period in seconds
S_{sRT}	1.245	Probabilistic risk-targeted ground motion. (0.2 second)
S_{sUH}	1.251	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
S_{sD}	1.5	Factored deterministic acceleration value. (0.2 second)
S_{1RT}	0.477	Probabilistic risk-targeted ground motion. (1.0 second)
S_{1UH}	0.498	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S_{1D}	0.6	Factored deterministic acceleration value. (1.0 second)
$PGAd$	0.6	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.996	Mapped value of the risk coefficient at short periods
C_{R1}	0.959	Mapped value of the risk coefficient at a period of 1 s

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TOLBrace™ Seismic Bracing Calculations

Project Address: ProVac
 2511 Inter Ave
 Puyallup, Wa
 Job # 4632

Contractor: Fire Sprinklers Inc
Address: 1524 45th St E - Suite 102
 Sumner, Wa, 98390
Phone: 253-826-0099
Licence: FIRESI*988RJ



Calculations based on 2019 NFPA Pamphlet #13

Brace Information	TOLCO™ Brace Components												
Maximum Brace Length 7' 0" (2.134 m) Diameter of Brace 1" Type of Brace Sch.40 Angle of Brace 45° Min. Least Rad. of Gyration 0.42" (11 mm) L/R Value 200 Max Horizontal Load 1310 lbs (594 kg)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>TOLCO™ Component</th> <th>Listed Load</th> <th>Adjusted Load</th> </tr> </thead> <tbody> <tr> <td>Fig. 4L Clamp</td> <td>2015 lbs (914 kg)</td> <td>1425 lbs (646 kg)</td> </tr> <tr> <td>Fig.980 Universal Swivel</td> <td>2015 lbs (914 kg)</td> <td>1425 lbs (646 kg)</td> </tr> <tr> <td>Fig.828 Across Beam</td> <td>2015 lbs (914 kg)</td> <td>1425 lbs (646 kg)</td> </tr> </tbody> </table> *Calculation Based on CONCENTRIC Loading *Please Note: These calculations are for TOLCO™ components only. Use of any other components voids these calculations and the listing of the assembly.	TOLCO™ Component	Listed Load	Adjusted Load	Fig. 4L Clamp	2015 lbs (914 kg)	1425 lbs (646 kg)	Fig.980 Universal Swivel	2015 lbs (914 kg)	1425 lbs (646 kg)	Fig.828 Across Beam	2015 lbs (914 kg)	1425 lbs (646 kg)
TOLCO™ Component	Listed Load	Adjusted Load											
Fig. 4L Clamp	2015 lbs (914 kg)	1425 lbs (646 kg)											
Fig.980 Universal Swivel	2015 lbs (914 kg)	1425 lbs (646 kg)											
Fig.828 Across Beam	2015 lbs (914 kg)	1425 lbs (646 kg)											
Seismic Brace Assembly Detail													
Brace Identification on Plans Longitudinal 1													
Brace Type Lateral [] Longitudinal [X] 4-Way []													

Fastener Information	
Orientation to Connecting Surface	NFPA Type B
Fastener Type	Fig.828 Across Beam
Diameter	N/A
Length	N/A
Maximum Load	1425 lbs (646 kg)
Prying Factor	N/A

Sprinkler System Load Calculation (Fpw = CpWp)					
Cp = 0.61					
Diameter	Type	Length	Total Length	Weight Per Unit Length	Total Weight
4" (100 mm)	Sch. 10	74 ft (22.6 m)	74 ft (22.6 m)	11.78 lb/ft (17.53 kg/m)	872 lbs (396 kg)
Subtotal Weight					872 lbs (396 kg)
Wp (incl. 15%)					1003 lbs (455 kg)
Main Size	Type/Sch.	Spacing (ft)	Total (Fpw)		897 lbs (407 kg)
4"	Sch. 10	74	Maximum Fpw per 18.5.5.2		N/A

TOLBrace™ Seismic Calculations

ProVac

Job # 4632

2511 Inter Ave



Brace Identification	Longitudinal 1
Brace Type (Per NFPA#13)	NFPA Type B
Braced Pipe (ft)	4" Sch.10 Steel Pipe
Spacing of Brace	74' 0" (22.56 m)
Orientation of Brace	Longitudinal
Bracing Material	1" Sch.40
Maximum Brace Length	7' 0" (2.13 m)
Slenderness Ratio used for Load Calculation	200
True Angle of Brace for Calculation	45°
Type of Fastener	Fig.828 Across Beam
Length of Fastener	N/A

Summary of Pipe within Zone of Influence

4" Sch.10 Steel Pipe (101.6 mm)	74 ft (22.6 m)

G-Factor Used 0.61

Allowance for Heads and Fittings 15%

Conclusions

Total Adjusted Load of Pipe in Zone of Influence	898 lbs (407 kg)
Material Capacity	1310 lbs (594 kg)
Fastener Capacity	1425 lbs (646 kg)
Fig. 4L Clamp	1425 lbs (646 kg)
Fig.980 Universal Swivel	1425 lbs (646 kg)
Structural Member	Steel I Beam

Calculations prepared by Hayden Baumann

* The description of the Structural Member is for informational purposes only.
TOLBrace™ software calculates the brace assembly only, not the structure it is attached to.
Calculated with TOLBrace™ 8
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TOLBrace™ Seismic Bracing Calculations

Project Address: ProVac
 2511 Inter Ave
 Puyallup, Wa
 Job # 4632

Contractor: Fire Sprinklers Inc
Address: 1524 45th St E - Suite 102
 Sumner, Wa, 98390
Phone: 253-826-0099
Licence: FIRESI*988RJ



Calculations based on 2019 NFPA Pamphlet #13

Brace Information	TOLCO™ Brace Components												
Maximum Brace Length 7' 0" (2.134 m) Diameter of Brace 1" Type of Brace Sch.40 Angle of Brace 45° Min. Least Rad. of Gyration 0.42" (11 mm) L/R Value 200 Max Horizontal Load 1310 lbs (594 kg)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>TOLCO™ Component</th> <th>Listed Load</th> <th>Adjusted Load</th> </tr> </thead> <tbody> <tr> <td>Fig. 1001 Clamp</td> <td>2015 lbs (914 kg)</td> <td>1425 lbs (646 kg)</td> </tr> <tr> <td>Fig.980 Universal Swivel</td> <td>2015 lbs (914 kg)</td> <td>1425 lbs (646 kg)</td> </tr> <tr> <td>Fig.828 Along Beam</td> <td>2015 lbs (914 kg)</td> <td>1425 lbs (646 kg)</td> </tr> </tbody> </table> *Calculation Based on CONCENTRIC Loading *Please Note: These calculations are for TOLCO™ components only. Use of any other components voids these calculations and the listing of the assembly.	TOLCO™ Component	Listed Load	Adjusted Load	Fig. 1001 Clamp	2015 lbs (914 kg)	1425 lbs (646 kg)	Fig.980 Universal Swivel	2015 lbs (914 kg)	1425 lbs (646 kg)	Fig.828 Along Beam	2015 lbs (914 kg)	1425 lbs (646 kg)
TOLCO™ Component	Listed Load	Adjusted Load											
Fig. 1001 Clamp	2015 lbs (914 kg)	1425 lbs (646 kg)											
Fig.980 Universal Swivel	2015 lbs (914 kg)	1425 lbs (646 kg)											
Fig.828 Along Beam	2015 lbs (914 kg)	1425 lbs (646 kg)											
Seismic Brace Assembly Detail													
Fastener Information Orientation to Connecting Surface NFPA Type H Fastener Type Fig.828 Along Beam Diameter N/A Length N/A Maximum Load 1425 lbs (646 kg) Prying Factor N/A													
Brace Identification on Plans Lateral 1 Brace Type Lateral [X] Longitudinal [] 4-Way []													

Sprinkler System Load Calculation (Fpw = CpWp)					
Cp = 0.61					
Diameter	Type	Length	Total Length	Weight Per Unit Length	Total Weight
4" (100 mm)	Sch. 10	25.0417 ft (7.6 m)	25.0417 ft (7.6 m)	11.78 lb/ft (17.53 kg/m)	295 lbs (134 kg)
1.25" (32 mm)	Sch. 10	56 ft (17.1 m)	56 ft (17.1 m)	2.52 lb/ft (3.75 kg/m)	141 lbs (64 kg)
Subtotal Weight					436 lbs (198 kg)
Wp (incl. 15%)					501 lbs (227 kg)
Main Size	Type/Sch.	Spacing (ft)	Total (Fpw)		449 lbs (203 kg)
4"	Sch. 10	25.0417	Maximum Fpw per 18.5.5.2		1071 lb (485 kg)

TOLBrace™ Seismic Calculations

ProVac

Job # 4632

2511 Inter Ave



Brace Identification	Lateral 1
Brace Type (Per NFPA#13)	NFPA Type H
Braced Pipe (ft)	4" Sch.10 Steel Pipe
Spacing of Brace	25' 0" (7.63 m)
Orientation of Brace	Lateral
Bracing Material	1" Sch.40
Maximum Brace Length	7' 0" (2.13 m)
Slenderness Ratio used for Load Calculation	200
True Angle of Brace for Calculation	45°
Type of Fastener	Fig.828 Along Beam
Length of Fastener	N/A

Summary of Pipe within Zone of Influence

4" Sch.10 Steel Pipe (101.6 mm)	25.0417 ft (7.6 m)
1.25" Sch.10 Steel Pipe (31.75 mm)	56 ft (17.1 m)

G-Factor Used 0.61

Allowance for Heads and Fittings 15%

Conclusions

Total Adjusted Load of Pipe in Zone of Influence	449 lbs (204 kg)
Material Capacity	1310 lbs (594 kg)
Fastener Capacity	1425 lbs (646 kg)
Fig. 1001 Clamp	1425 lbs (646 kg)
Fig.980 Universal Swivel	1425 lbs (646 kg)
Structural Member	Steel I BEAM

Calculations prepared by Hayden Baumann

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