McKinstry Fire Protection
5005 3RD Avenue South
Seattle, WA 98124

HYDRAULIC CALCULATIONS FOR

KPP
6TH and Central
Kirkland, WA

DRAWING NUMBER: FP-L5 DATE: 4-20-2016

-DESIGN DATA-

REMOTE AREA NUMBER: TWO REMOTE AREA LOCATION: 5th Floor Office
OCCUPANCY CLASSIFICATION: Light Hazard
DENSITY: .10 gpm/sq. ft.
AREA OF APPLICATION: 1500 sq. ft.

COVERAGE PER SPRINKLER: 196 MAX sq. ft. Calculated
TYPE OF SPRINKLERS CALCULATED: 5.6k Q.R.
NUMBER OF SPRINKLERS CALCULATED: 11

*IN-RACK SPRINKLER DEMAND: NA gpm
HOSE-STREAM DEMAND: 100 gpm
TOTAL WATER REQUIRED (INCLUDING HOSE): 339.8 gpm
FLOW AND PRESSURE (AT NODE BOR, BOR): 239.8 gpm @ 67.8 psi

INSTALLING CONTRACTOR
Name: McKinstry Fire Protection

AUTHORITY HAVING JURISDICTION: City of Kirkland, Fire Dept.

NOTES: NA
Calculations performed by HASS under license # 50091140 ,
granted by HRS SYSTEMS, INC.
(Notes continue after pipe calculations results.)

WASHINGTON STATE
CERTIFICATE OF COMPENTENCY
FIRE PROTECTION SPRINKLER SYSTEMS

J. Scott Spitzer, Sr.
5763-1094-C Level 3
McKinstry Company, L.L.C.
MCKINCL942DW

Date

Jon Scott Spitzer, Sr

Digitally signed by Jon Scott Spitzer, Sr
DN: C=US, E=scottsp@mckinstry.com, O="McKinstry, L.L.C.", OU=Account Executive - Fire Protection Design Manager, CN="Jon Scott Spitzer, Sr"
Reason: I am approving this document
Date: 2016.04.25 07:16:30-07'00'

Signature

Expires
12/31/16

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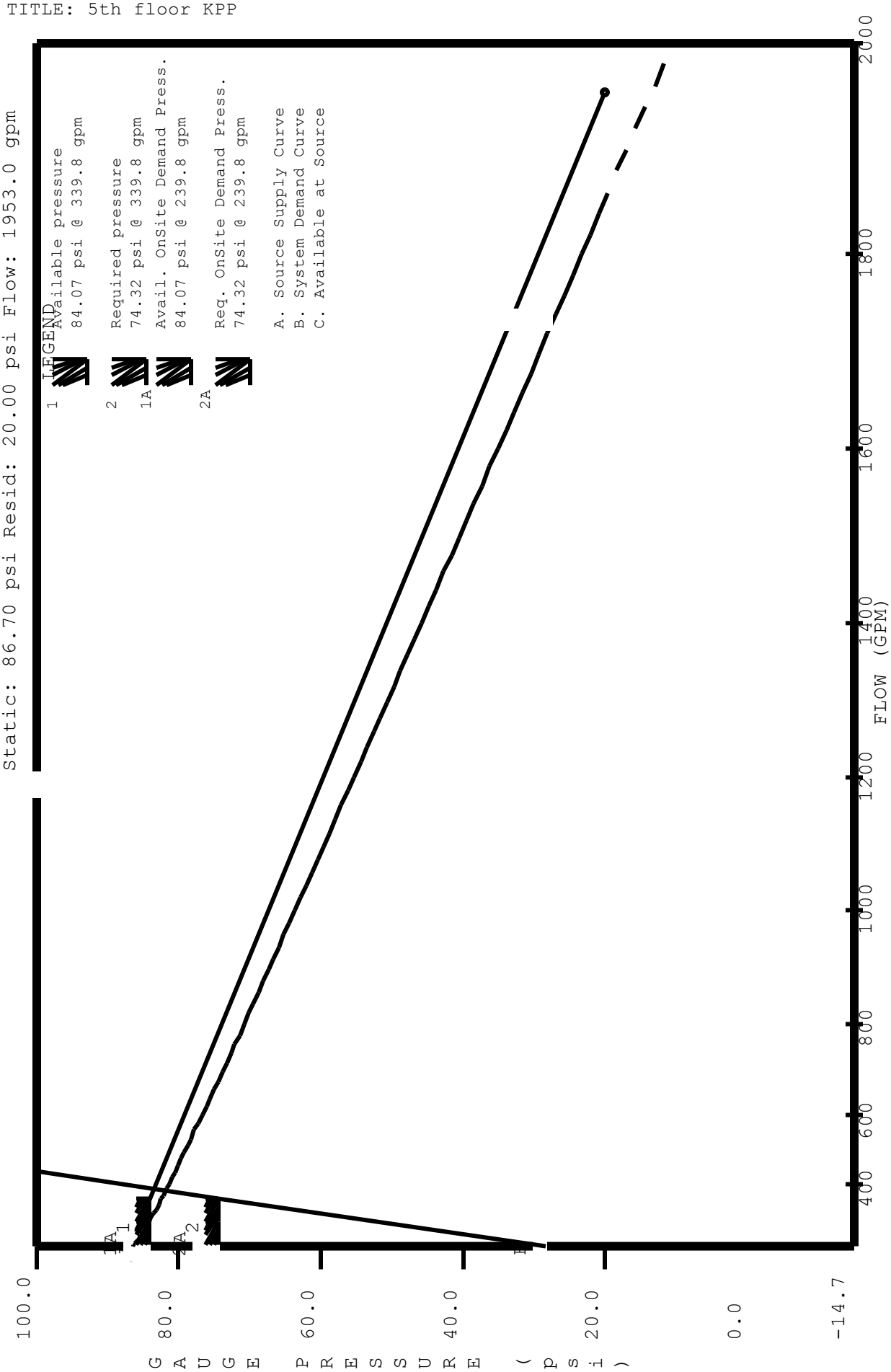
JOB TITLE: 5th floor KPP

WATER SUPPLY ANALYSIS

Static: 86.70 psi Resid: 20.00 psi Flow: 1953.0 gpm



Note: (1) Dashed Lines indicate extrapolated values from Test Results
(2) On Site pressures are based on hose stream deduction at the source

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JOB TITLE: 5th floor KPP

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	86.7	20.0	1953.0	84.1	339.8	74.3

AGGREGATE FLOW ANALYSIS:

TOTAL FLOW AT SOURCE	339.8 GPM
TOTAL HOSE STREAM ALLOWANCE AT SOURCE	100.0 GPM
OTHER HOSE STREAM ALLOWANCES	0.0 GPM
TOTAL DISCHARGE FROM ACTIVE SPRINKLERS	239.8 GPM

NODE ANALYSIS DATA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)	NOTES
1	122.5	K= 5.49	12.7	19.6	
2	122.5	K= 5.36	14.4	20.3	
3	122.5	K= 5.60	16.4	22.7	
4	122.5	- - - -	17.9	- - -	
5	122.5	- - - -	17.9	- - -	
6	122.5	K= 5.41	15.9	21.6	
7	122.5	K= 5.41	16.6	22.0	
8	122.5	- - - -	18.6	- - -	
9	122.5	K= 5.41	15.3	21.1	
10	122.5	K= 5.32	16.0	21.3	
11	122.5	K= 5.32	17.0	21.9	
12	122.5	- - - -	18.7	- - -	
13	122.5	K= 5.33	17.0	22.0	
14	122.5	K= 5.33	17.3	22.2	
15	122.5	- - - -	22.6	- - -	
16	122.5	K= 5.35	22.1	25.1	
17	122.5	- - - -	25.2	- - -	
18	122.5	- - - -	26.6	- - -	
19	122.5	- - - -	34.7	- - -	
TOP2	122.5	- - - -	37.4	- - -	
BOP2	112.5	- - - -	42.7	- - -	
TOR	68.0	- - - -	63.2	- - -	
BOR	60.0	- - - -	67.8	- - -	
UG	57.0	- - - -	74.1	- - -	
UG1	57.0	- - - -	74.2	- - -	
UG2	57.0	- - - -	74.2	- - -	
BF1	60.0	- - - -	67.8	- - -	
BF2	60.0	- - - -	72.8	- - -	
SRC	57.0	SOURCE	74.3	239.8	

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JOB TITLE: 5th floor KPP

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)	Note
Pipe: 1		5.49	19.6	Disch			8.00	100	1.7	
2	122.5	14.4	0.0		1.000	E: 1.4	1.43		0.0	
1	122.5	12.7	19.6		1.049		9.43	0.176	1.7	
Pipe: 2		5.36	20.3	Disch			11.50	100	2.0	
3	122.5	16.4	19.6	1	1.250	----	0.00		0.0	
2	122.5	14.4	39.9		1.380		11.50	0.172	2.0	
Pipe: 3		5.60	22.7	Disch			2.58	100	1.5	
5	122.5	17.9	39.9	2	1.500	T: 5.7	5.71		0.0	
3	122.5	16.4	62.6		1.610		8.29	0.187	1.5	
Pipe: 4		5.41	21.6	Disch			11.50	100	0.6	
7	122.5	16.6	0.0		1.250	----	0.00		0.0	
6	122.5	15.9	21.6		1.380		11.50	0.055	0.6	
Pipe: 5		5.41	22.0	Disch			8.58	100	1.4	
5	122.5	17.9	21.6	6	1.500	T: 5.7	5.71		0.0	
7	122.5	16.6	43.6		1.610		14.29	0.096	1.4	
Pipe: 6		0.0	0.0				1.00	100	0.0	
5	122.5	17.9	0.0		2.500	----	0.00		0.0	
4	122.5	17.9	0.0		2.469		1.00	0.000	0.0	
Pipe: 7		0.0	62.6	3			11.25	100	0.7	
8	122.5	18.6	43.6	7	2.500	----	0.00		0.0	
5	122.5	17.9	106.2		2.469		11.25	0.062	0.7	
Pipe: 8		5.41	21.1	Disch			10.50	100	0.7	
10	122.5	16.0	0.0		1.250	E: 2.1	2.14		0.0	
9	122.5	15.3	21.1		1.380		12.64	0.053	0.7	
Pipe: 9		5.32	21.3	Disch			11.50	100	1.0	
11	122.5	17.0	21.1	9	1.500	----	0.00		0.0	
10	122.5	16.0	42.4		1.610		11.50	0.091	1.0	
Pipe: 10		5.32	21.9	Disch			2.58	100	1.6	
8	122.5	18.6	42.4	10	1.500	T: 5.7	5.71		0.0	
11	122.5	17.0	64.3		1.610		8.29	0.197	1.6	
Pipe: 11		5.33	22.0	Disch			11.50	100	0.3	
14	122.5	17.3	0.0		1.500	----	0.00		0.0	
13	122.5	17.0	22.0		1.610		11.50	0.027	0.3	
Pipe: 12		5.33	22.2	Disch			8.58	100	1.4	
12	122.5	18.7	22.0	13	1.500	T: 5.7	5.71		0.0	
14	122.5	17.3	44.1		1.610		14.29	0.098	1.4	

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JOB TITLE: 5th floor KPP

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)	Note
Pipe: 13		0.0	64.3	11			0.50	100	0.1	
12	122.5	18.7	106.2	5	2.500	----	0.00		0.0	
8	122.5	18.6	170.6		2.469		0.50	0.149	0.1	
Pipe: 14		0.0	170.6	8			17.08	100	3.9	
15	122.5	22.6	44.1	14	2.500	----	0.00		0.0	
12	122.5	18.7	214.7		2.469		17.08	0.228	3.9	
Pipe: 15		5.35	25.1	Disch			2.58	100	0.5	
15	122.5	22.6	0.0		1.250	T: 4.3	4.28		0.0	
16	122.5	22.1	25.1		1.380		6.87	0.073	0.5	
Pipe: 16		0.0	214.7	12			0.67	100	2.6	
17	122.5	25.2	25.1	16	2.500	T: 8.6	8.56		0.0	
15	122.5	22.6	239.8		2.469		9.23	0.279	2.6	
Pipe: 17		0.0	239.8	15			13.75	100	1.5	
18	122.5	26.6	-117.0	19	2.500	E: 4.3	4.28		0.0	
17	122.5	25.2	122.8		2.469		18.03	0.081	1.5	
Pipe: 18		0.0	0.0				95.17	100	8.1	
19	122.5	34.7	122.8	17	2.500	E: 4.3	4.28		0.0	
18	122.5	26.6	122.8		2.469		99.45	0.081	8.1	
Pipe: 19		0.0	239.8	15			119.83	100	9.5	
19	122.5	34.7	-122.8	18	2.500	2E: 8.6	8.56		0.0	
17	122.5	25.2	117.0		2.469		128.40	0.074	9.5	
Pipe: 20		0.0	117.0	17			7.50	100	2.7	
TOP2	122.5	37.4	122.8	18	3.000	2E:10.0	20.70		0.0	
19	122.5	34.7	239.8		3.068	T:10.7	28.20	0.097	2.7	
Pipe: 21		0.0	0.0			E:10.0	10.00	120	5.3	
BOP2	112.5	42.7	239.8	19	4.000	T:20.0	42.00		-4.3	
TOP2	122.5	37.4	239.8		4.026	B:12.0	52.00	0.018	1.0	
Pipe: 22		0.0	0.0				44.50	120	20.5	
TOR	68.0	63.2	239.8	TOP2	4.000	T:20.0	20.00		-19.3	
BOP2	112.5	42.7	239.8		4.026		64.50	0.018	1.2	
Pipe: 23		0.0	0.0			E:10.0	8.00	120	4.6	
BOR	60.0	67.8	239.8	BOP2	4.000	T:20.0	52.00		-3.5	
TOR	68.0	63.2	239.8		4.026	C:22.0	60.00	0.018	1.1	
Pipe: 24		0.0	0.0				2.00	120	0.0	
BF1	60.0	67.8	239.8	TOR	4.000	----	0.00		0.0	
BOR	60.0	67.8	239.8		4.026		2.00	0.018	0.0	
Pipe: 25			0.0	Fixed Pressure Loss Device						
BF2	60.0	72.8	239.8	BOR	5.0 psi, 239.8 gpm					
BF1	60.0	67.8	239.8							

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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)	Note
Pipe: 26		0.0	0.0				4.00	140	1.3	
UG	57.0	74.1	239.8	BF1	6.000	L:14.1	14.07		-1.3	
BF2	60.0	72.8	239.8		6.270		18.07	0.002	0.0	
Pipe: 27		0.0	0.0				66.00	140	0.1	
UG1	57.0	74.2	239.8	BF2	8.000	T:59.0	65.78		0.0	
UG	57.0	74.1	239.8		8.380	G: 6.7	131.78	0.000	0.1	
Pipe: 28		0.0	0.0				66.00	140	0.1	
UG2	57.0	74.2	239.8	UG	8.000	T:59.0	65.78		0.0	
UG1	57.0	74.2	239.8		8.380	G: 6.7	131.78	0.000	0.1	
Pipe: 29		Source	0.0				165.00	140	0.1	
SRC	57.0	74.3	239.8	UG1	8.000	T:59.0	65.78		0.0	
UG2	57.0	74.2	239.8		8.380	G: 6.7	230.78	0.000	0.1	

NOTES (HASS):

(1) Calculations were performed by the HASS 8.5 computer program under license no. 50091140 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 0.101 gpm.

(3) Total pressure at each node is used in balancing the system. Maximum water velocity is 16.1 ft/sec at pipe 16.

(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 83.67 psi compared to the minimum required pressure of 20.00 psi.

(6) PIPE FITTINGS TABLE

Pipe Table Name: STANDARD.PIP

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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
6.270	16.46	35.27	10.58	37.62	11.76	3.53	32.92	32.92	35.27
8.380	22.83	44.39	16.49	57.07	15.22	5.07	39.31	39.31	44.39

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 NPTee
1.049	2.00	5.00	2.00	5.00	6.00	1.00	10.00	2.00	5.00
1.380	3.00	6.00	2.00	7.00	6.00	1.00	10.00	10.00	6.00
1.610	4.00	8.00	2.00	9.00	6.00	1.00	10.00	10.00	8.00
2.469	6.00	12.00	4.00	14.00	7.00	1.00	10.00	10.00	12.00
3.068	7.00	15.00	5.00	16.00	10.00	1.00	13.00	13.00	15.00
4.026	10.00	20.00	6.00	22.00	12.00	2.00	20.00	20.00	20.00