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~~ ONE REMOTE AREA LOCATION: Penthouse Mech. RM.

OCCUPANCY CLASSIFICATION: Ordinary Hazard Group II
DENSITY: .20 gpm/sq. ft.
AREA OF APPLICATION: 1500 s.f. (INCREASED 30%) REDUCED PER NFPA 11.2.3.2.3

OVERALL AREA: 1535 S.F.

COVERAGE PER SPRINKLER: 99 MAX sq. ft. Calculated
TYPE OF SPRINKLERS CALCULATED: 5.6k Q.R.
NUMBER OF SPRINKLERS CALCULATED: 16

*IN-RACK SPRINKLER DEMAND: NA gpm
HOSE-STREAM DEMAND: 250 gpm
TOTAL WATER REQUIRED (INCLUDING HOSE): 610.3 gpm
FLOW AND PRESSURE (AT NODE BOR, BOR): 360.2 gpm @ 67.0 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, LLC.", OU=Account Executive - Fire Protection Design Manager, CN="Jon Scott Spitzer, Sr"
Reason: I am approving this document
Date: 2016.04.25 07:16:57-07'00'

Expires
12/31/16

Signature

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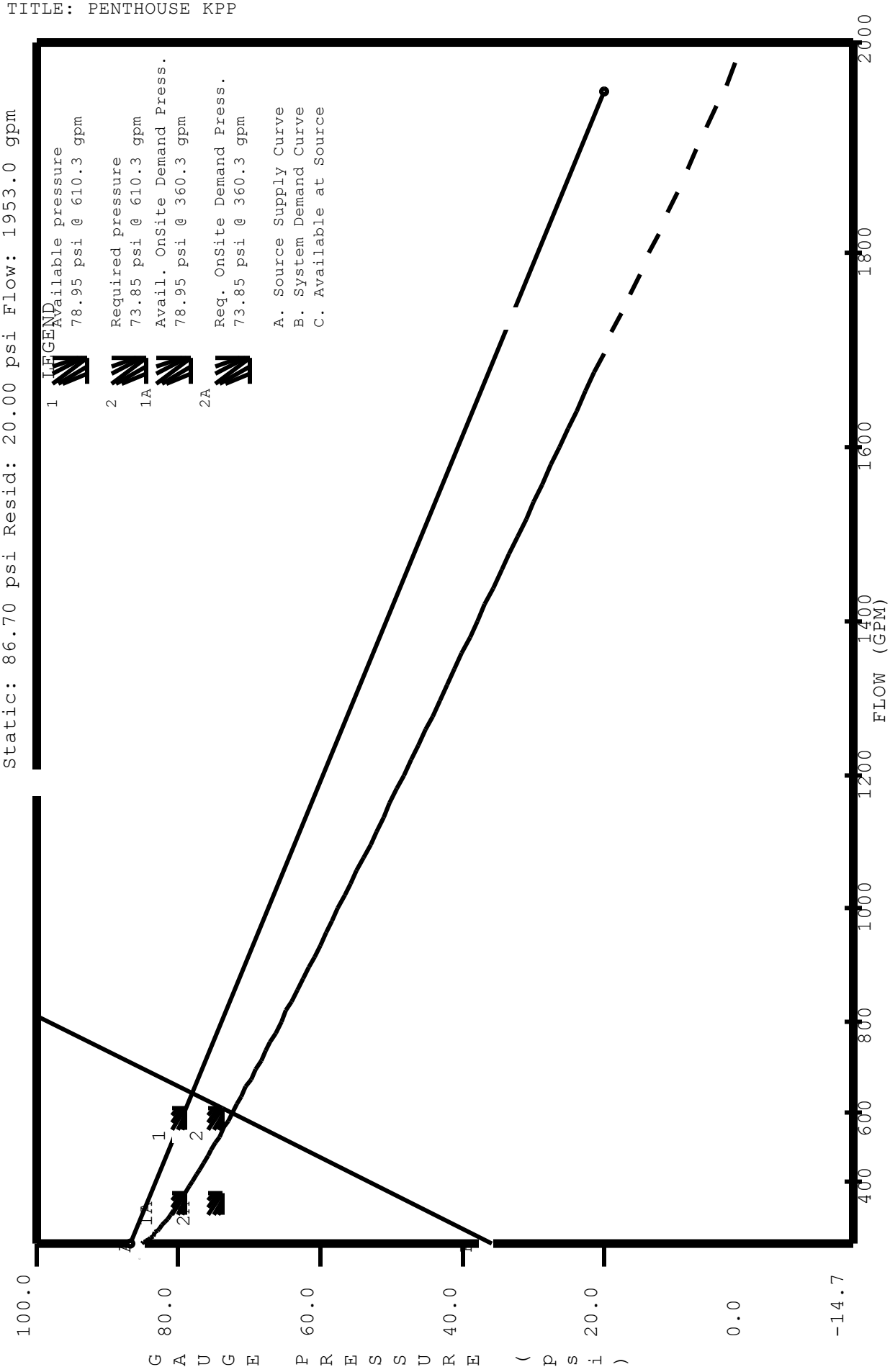
JOB TITLE: PENTHOUSE KPP

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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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	78.9	610.3	73.8

AGGREGATE FLOW ANALYSIS:

TOTAL FLOW AT SOURCE	610.3 GPM
TOTAL HOSE STREAM ALLOWANCE AT SOURCE	250.0 GPM
OTHER HOSE STREAM ALLOWANCES	0.0 GPM
TOTAL DISCHARGE FROM ACTIVE SPRINKLERS	360.3 GPM

NODE ANALYSIS DATA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)	NOTES
1	135.0	K= 5.60	14.7	21.5	
2	135.0	K= 5.60	15.3	21.9	
3	135.0	K= 5.60	15.7	22.2	
4	135.0	- - - -	16.3	- - -	
5	135.0	- - - -	16.4	- - -	
6	134.0	- - - -	17.3	- - -	
7	134.0	- - - -	17.4	- - -	
8	139.8	- - - -	14.0	- - -	
9	139.8	K= 5.60	12.5	19.8	
10	139.8	K= 5.60	13.1	20.2	
11	139.8	K= 5.60	13.2	20.4	
12	139.8	K= 5.60	13.9	20.9	
13	134.0	- - - -	17.7	- - -	
14	139.8	- - - -	14.3	- - -	
15	139.8	K= 5.60	12.7	20.0	
16	139.8	K= 5.60	13.3	20.4	
17	139.8	K= 5.60	13.7	20.7	
18	139.8	K= 5.60	14.2	21.1	
19	134.0	K= 5.60	18.4	24.0	
20	135.0	- - - -	23.4	- - -	
21	135.0	K= 5.60	21.5	26.0	
22	135.0	K= 5.60	22.2	26.4	
23	135.0	K= 5.60	23.3	27.0	
24	134.0	K= 5.60	24.4	27.7	
TOP1	134.0	- - - -	27.5	- - -	
BOP1	124.0	- - - -	33.9	- - -	
TOR	68.0	- - - -	61.2	- - -	
BOR	60.0	- - - -	67.0	- - -	
UG	57.0	- - - -	73.4	- - -	
UG1	57.0	- - - -	73.5	- - -	
UG2	57.0	- - - -	73.7	- - -	
BF1	60.0	- - - -	67.1	- - -	
BF2	60.0	- - - -	72.1	- - -	
SRC	57.0	SOURCE	73.8	360.3	

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JOB TITLE: PENTHOUSE 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		5.60	21.5	Disch			12.00	100	0.7	
2	135.0	15.3	0.0		1.250	----	0.00		0.0	
1	135.0	14.7	21.5		1.380		12.00	0.055	0.7	
Pipe: 2		5.60	21.9	Disch			11.67	100	1.1	
5	135.0	16.4	21.5	1	1.500	----	0.00		0.0	
2	135.0	15.3	43.4		1.610		11.67	0.095	1.1	
Pipe: 3		5.60	22.2	Disch			10.00	100	0.6	
4	135.0	16.3	0.0		1.250	----	0.00		0.0	
3	135.0	15.7	22.2		1.380		10.00	0.058	0.6	
Pipe: 4		0.0	0.0				1.00	100	0.2	
5	135.0	16.4	22.2		1.500	2E: 5.7	5.71		0.0	
4	135.0	16.3	22.2		1.610		6.71	0.027	0.2	
Pipe: 5		0.0	22.2	4			1.00	100	0.9	
6	134.0	17.3	43.4	2	2.500	2T:17.1	17.13		-0.4	
5	135.0	16.4	65.6		2.469		18.13	0.025	0.5	
Pipe: 6		0.0	0.0				8.25	100	0.1	
7	134.0	17.4	65.6	5	3.000	----	0.00		0.0	
6	134.0	17.3	65.6		3.068		8.25	0.009	0.1	
Pipe: 7		0.0	41.3	12			5.67	100	3.4	
7	134.0	17.4	40.0	10	2.500	2T:17.1	17.13		-2.5	
8	139.8	14.0	81.3		2.469		22.80	0.038	0.9	
Pipe: 8		5.60	19.8	Disch			12.00	100	0.6	
10	139.8	13.1	0.0		1.250	----	0.00		0.0	
9	139.8	12.5	19.8		1.380		12.00	0.047	0.6	
Pipe: 9		5.60	20.2	Disch			11.67	100	1.0	
8	139.8	14.0	19.8	9	1.500	----	0.00		0.0	
10	139.8	13.1	40.0		1.610		11.67	0.082	1.0	
Pipe: 10		5.60	20.4	Disch			10.25	100	0.7	
12	139.8	13.9	0.0		1.250	2E: 4.3	4.28		0.0	
11	139.8	13.2	20.4		1.380		14.53	0.050	0.7	
Pipe: 11		5.60	20.9	Disch			1.00	100	0.1	
8	139.8	14.0	20.4		1.500	----	0.00		0.0	
12	139.8	13.9	41.3		1.610		1.00	0.086	0.1	
Pipe: 12		0.0	81.3	8			7.50	100	0.3	
13	134.0	17.7	65.6	6	3.000	----	0.00		0.0	
7	134.0	17.4	146.9		3.068		7.50	0.039	0.3	

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JOB TITLE: PENTHOUSE 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	41.8	18			5.83	100	3.4	
13	134.0	17.7	40.4	16	2.500	2T:17.1	17.13		-2.5	
14	139.8	14.3	82.3		2.469		22.96	0.039	0.9	
Pipe: 14		5.60	20.0	Disch			12.00	100	0.6	
16	139.8	13.3	0.0		1.250	----	0.00		0.0	
15	139.8	12.7	20.0		1.380		12.00	0.048	0.6	
Pipe: 15		5.60	20.4	Disch			11.67	100	1.0	
14	139.8	14.3	20.0	15	1.500	----	0.00		0.0	
16	139.8	13.3	40.4		1.610		11.67	0.083	1.0	
Pipe: 16		5.60	20.7	Disch			14.83	100	0.5	
18	139.8	14.2	0.0		1.500	2E: 5.7	5.71		0.0	
17	139.8	13.7	20.7		1.610		20.54	0.024	0.5	
Pipe: 17		5.60	21.1	Disch			1.00	100	0.1	
14	139.8	14.3	20.7	17	1.500	----	0.00		0.0	
18	139.8	14.2	41.8		1.610		1.00	0.089	0.1	
Pipe: 18		0.0	82.3	14			8.25	100	0.7	
19	134.0	18.4	146.9	7	3.000	----	0.00		0.0	
13	134.0	17.7	229.1		3.068		8.25	0.089	0.7	
Pipe: 19		5.60	24.0	Disch			0.33	120	4.9	
20	135.0	23.4	229.1	13	2.500	2T:24.0	24.00		0.4	
19	134.0	18.4	253.2		2.469		24.33	0.220	5.4	
Pipe: 20		5.60	26.0	Disch			12.00	120	0.7	
22	135.0	22.2	0.0		1.250	----	0.00		0.0	
21	135.0	21.5	26.0		1.380		12.00	0.056	0.7	
Pipe: 21		5.60	26.4	Disch			12.00	120	1.2	
20	135.0	23.4	26.0	21	1.500	----	0.00		0.0	
22	135.0	22.2	52.4		1.610		12.00	0.096	1.2	
Pipe: 22		5.60	27.0	Disch			15.00	120	1.1	
24	134.0	24.4	0.0		1.500	2E: 8.0	8.00		-0.4	
23	135.0	23.3	27.0		1.610		23.00	0.028	0.6	
Pipe: 23		0.0	52.4	22			1.00	120	1.0	
24	134.0	24.4	253.2	19	1.500	----	0.00		-0.4	
20	135.0	23.4	139.3		1.610		1.00	0.586	0.6	
Pipe: 24		0.0	52.4	22			16.67	120	1.0	
24	134.0	24.4	253.2	19	3.000	----	0.00		-0.4	
20	135.0	23.4	166.2		3.068		16.67	0.035	0.6	
		5.60	27.7	Disch						
Pipe: 25			166.2	20			22.00	100	3.2	
TOP1	134.0	27.5	139.3	20	4.000	3E:21.4	35.68		0.0	
24	134.0	24.4	360.2		4.026	T:14.3	57.68	0.055	3.2	

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JOB TITLE: PENTHOUSE KPP

Pipe Tag / Frm Node / To Node	El (ft)	K-fac 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			E:10.0	10.00	120	6.4	
BOP1	124.0	33.9	360.2	24	4.000	T:20.0	42.00		-4.3	
TOP1	134.0	27.5	360.2		4.026	B:12.0	52.00	0.039	2.0	
Pipe: 27		0.0	0.0				56.00	120	27.2	
TOR	68.0	61.2	360.2	TOP1	4.000	T:20.0	20.00		-24.3	
BOP1	124.0	33.9	360.2		4.026		76.00	0.039	3.0	
Pipe: 28		0.0	0.0			E:10.0	8.00	120	5.8	
BOR	60.0	67.0	360.2	BOP1	4.000	T:20.0	52.00		-3.5	
TOR	68.0	61.2	360.2		4.026	C:22.0	60.00	0.039	2.3	
Pipe: 29		0.0	0.0				2.00	100	0.1	
BF1	60.0	67.1	360.2	TOR	4.000	----	0.00		0.0	
BOR	60.0	67.0	360.2		4.026		2.00	0.055	0.1	
Pipe: 30			0.0	Fixed Pressure Loss Device						
BF2	60.0	72.1	360.2	BOR	5.0 psi, 360.2 gpm					
BF1	60.0	67.1	360.2							
Pipe: 31		0.0	0.0				4.00	140	1.4	
UG	57.0	73.4	360.2	BF1	6.000	L:14.1	14.07		-1.3	
BF2	60.0	72.1	360.2		6.270		18.07	0.003	0.1	
Pipe: 32		0.0	0.0				66.00	140	0.1	
UG1	57.0	73.5	360.2	BF2	8.000	T:59.0	65.78		0.0	
UG	57.0	73.4	360.2		8.380	G: 6.7	131.78	0.001	0.1	
Pipe: 33		0.0	0.0				66.00	140	0.1	
UG2	57.0	73.7	360.2	UG	8.000	T:59.0	65.78		0.0	
UG1	57.0	73.5	360.2		8.380	G: 6.7	131.78	0.001	0.1	
Pipe: 34		Source	0.0				165.00	140	0.2	
SRC	57.0	73.8	360.2	UG1	8.000	T:59.0	65.78		0.0	
UG2	57.0	73.7	360.3		8.380	G: 6.7	230.78	0.001	0.2	

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 0.002 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 22.0 ft/sec at pipe 23.