

Hydraulic Design Information Sheet

Name - PACK EDGE Date - 07-31-13
Location - 352 PRESUMPCOT STREET PORTLAND, ME
Building - System No. - 1 of 1
Contractor - Residential Fire Protection Contract No. - C12020
Calculated By - JAL Drawing No. - 1 OF 1
Construction: () Combustible (X) Non-Combustible Ceiling Height - VARIES
Occupancy - WAREHOUSE

S (X) NFPA 13 () Lt. Haz. Ord.Haz.Gp. () 1 () 2 () 3 () Ex.Haz.
Y () NFPA 231 () NFPA 231C () Figure Curve

S Other ESFR DESIGN

T Specific Ruling Made By Date

E
M Area of Sprinkler Operation - 12 HEADS System Type Sprinkler/Nozzle
Density - .1 (X) Wet Make Viking
D Area Per Sprinkler - 96 () Dry Model VK510
E Elevation at Highest Outlet - 22.830 () Deluge Size 1"
S Hose Allowance - Inside - () Preaction K-Factor 25.2
I Rack Sprinkler Allowance - () Other Temp.Rat.165
G Hose Allowance - Outside - 250

N Note SAFETY MARGIN: 15.130 PSI

Calculation Flow Required - 1446.29 Press Required - 80.935
Summary C-Factor Used: 120 Overhead 140 Underground

W Water Flow Test: Pump Data: Tank or Reservoir:
A Date of Test - 4-7-06 Cap. -
T Time of Test - Rated Cap.- Elev.-
E Static Press - 102 @ Press -
R Residual Press - 88 Elev. - Well
Flow - 2300 Proof Flow
S Elevation - 0

U
P Location - HYDRANT #1245

P
L Source of Information - PORTLAND WATER DISTRICT
Y

C Commodity CARDBOARD AND PLASTIC Class IV Location
O Storage Ht. 20 FT Area Aisle W. 10 FT
M Storage Method: Solid Piled % Palletized % Rack

M
S R () Single Row (X) Conven. Pallet () Auto. Storage (X) Encap.
T A (X) Double Row () Slave Pallet () Solid Shelf () Non
O C () Mult. Row (X) Open Shelf

R K Flue Spacing Clearance:Storage to Ceiling 36" MIN
A Longitudinal Transverse

G
E Horizontal Barriers Provided:

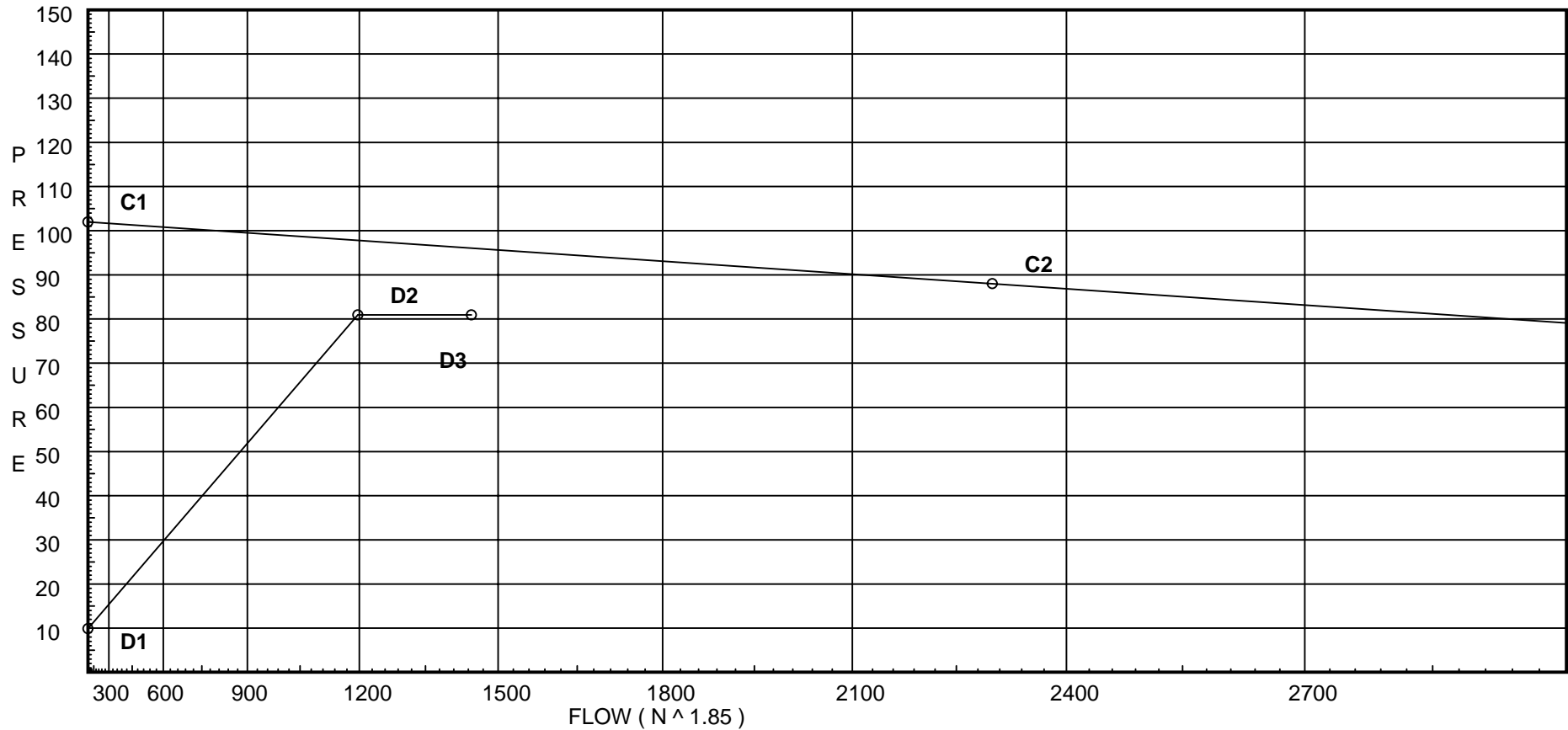
Water Supply Curve (C)

RESIDENTIAL FIRE PROTECTION
Packedge addition

Page 2
Date 7-31-13

City Water Supply:
C1 - Static Pressure : 102
C2 - Residual Pressure: 88
C2 - Residual Flow : 2300

Demand:
D1 - Elevation : 9.888
D2 - System Flow : 1196.29
D2 - System Pressure : 80.935
Hose (Adj City) : _____
Hose (Demand) : 250
D3 - System Demand : 1446.29
Safety Margin : 15.130



Fittings Used Summary

RESIDENTIAL FIRE PROTECTION
 Packedge addition

Page 3
 Date 7-31-13

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
E	90' Standard Elbow	2	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
G	Generic Gate Valve	0	0	1	1	1	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13
T	90' Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121
Z	Generic Flow Switch	2	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61

Pressure / Flow Summary - STANDARD

RESIDENTIAL FIRE PROTECTION
Packedge addition

Page 4
Date 7-31-13

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
80	22.83	25.2	15.0	na	97.6	1.0	96	15.0
81	22.33	25.2	15.55	na	99.36	1.0	96	15.0
83	21.33	25.2	15.88	na	100.43	1.0	96	15.0
82	21.83	25.2	16.01	na	100.84	1.0	96	15.0
84	22.83	25.2	15.02	na	97.67	1.0	96	15.0
85	22.33	25.2	15.57	na	99.43	1.0	96	15.0
86	21.83	25.2	16.04	na	100.91	1.0	96	15.0
87	21.33	25.2	15.9	na	100.5	1.0	96	15.0
88	22.83	25.2	15.1	na	97.93	1.0	96	15.0
89	22.33	25.2	15.65	na	99.69	1.0	96	15.0
90	21.83	25.2	16.12	na	101.17	1.0	96	15.0
91	21.33	25.2	15.98	na	100.75	1.0	96	15.0
72	19.25		17.66	na				
73	19.25		17.75	na				
71	19.25		17.64	na				
61	19.25		30.61	na				
62	19.25		30.65	na				
63	19.25		30.8	na				
64	19.25		35.08	na				
1	19.25		39.87	na				
2	19.25		41.09	na				
3	19.25		42.31	na				
4	19.25		43.52	na				
5	19.25		41.23	na				
6	19.25		42.3	na				
7	19.25		43.37	na				
8	19.25		44.44	na				
9	19.25		42.34	na				
10	19.25		43.29	na				
11	19.25		44.25	na				
12	19.25		45.2	na				
40	19.25		35.36	na				
41	19.25		37.24	na				
42	19.25		38.79	na				
23	19.25		51.31	na				
24	19.25		51.36	na				
25	19.25		51.43	na				
26	19.25		51.52	na				
27	19.25		51.63	na				
28	19.25		51.78	na				
29	19.25		51.96	na				
30	19.25		52.16	na				
31	19.25		53.3	na				
32	19.25		53.3	na				
20	19.25		51.26	na				
21	19.25		51.26	na				
22	19.25		51.28	na				
60	19.25		53.35	na				
43	19.25		40.06	na				
44	19.25		41.07	na				
45	19.25		41.87	na				
46	19.25		42.49	na				
47	19.25		42.96	na				
48	19.25		43.29	na				
49	19.25		43.51	na				
50	19.25		43.64	na				
51	19.25		43.7	na				
TR	1.0		65.52	na				
BR	0.0		75.38	na				
TEST	0.0		80.94	na	250.0			

The maximum velocity is 26.93 and it occurs in the pipe between nodes 64 and 40

Final Calculations - Hazen-Williams

RESIDENTIAL FIRE PROTECTION
Packedge addition

Page 5
Date 7-31-13

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
80 to 81	97.60 97.6	2.635 120 0.0275	0.0 0.0 0.0	12.000 0.0 12.000	15.000 0.217 0.330		K Factor = 25.20		
81 to 71	99.36 196.96	2.635 120 0.1009	0.0 0.0 0.0	7.500 0.0 7.500	15.547 1.334 0.757		K Factor = 25.20	Vel = 5.74	
	0.0 196.96				17.638		K Factor = 46.90		
83 to 82	100.43 100.43	2.635 120 0.0291	0.0 0.0 0.0	12.000 0.0 12.000	15.881 -0.217 0.349		K Factor = 25.20	Vel = 5.91	
82 to 71	100.84 201.27	2.635 120 0.1052	0.0 0.0 0.0	4.830 0.0 4.830	16.013 1.117 0.508		K Factor = 25.20	Vel = 11.84	
	0.0 201.27				17.638		K Factor = 47.92		
84 to 85	97.67 97.67	2.635 120 0.0276	0.0 0.0 0.0	12.000 0.0 12.000	15.022 0.217 0.331		K Factor = 25.20	Vel = 5.75	
85 to 72	99.43 197.1	2.635 120 0.1011	0.0 0.0 0.0	7.500 0.0 7.500	15.570 1.334 0.758		K Factor = 25.20	Vel = 11.60	
	0.0 197.10				17.662		K Factor = 46.90		
86 to 72	201.41 201.41	2.635 120 0.1054	0.0 0.0 0.0	4.830 0.0 4.830	16.036 1.117 0.509		K Factor = 25.20	Vel = 11.85	
	0.0 201.41				17.662		K Factor = 47.92		
87 to 86	100.50 100.5	2.635 120 0.0291	0.0 0.0 0.0	12.000 0.0 12.000	15.904 -0.217 0.349		K Factor = 25.20	Vel = 5.91	
	0.0 100.50				16.036		K Factor = 25.10		
88 to 89	97.93 97.93	2.635 120 0.0277	0.0 0.0 0.0	12.000 0.0 12.000	15.102 0.217 0.332		K Factor = 25.20	Vel = 5.76	
89 to 73	99.69 197.62	2.635 120 0.1015	0.0 0.0 0.0	7.500 0.0 7.500	15.651 1.334 0.761		K Factor = 25.20	Vel = 11.63	
	0.0 197.62				17.746		K Factor = 46.91		
90 to 73	201.92 201.92	2.635 120 0.1058	0.0 0.0 0.0	4.830 0.0 4.830	16.118 1.117 0.511		K Factor = 25.20	Vel = 11.88	
	0.0 201.92				17.746		K Factor = 47.93		
91 to 90	100.75 100.75	2.635 120 0.0292	0.0 0.0 0.0	12.000 0.0 12.000	15.984 -0.217 0.351		K Factor = 25.20	Vel = 5.93	

Final Calculations - Standard

RESIDENTIAL FIRE PROTECTION
 Packedge addition

Page 6
 Date 7-31-13

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
	0.0 100.75						16.118		K Factor = 25.10	
72 to 62	398.52 398.52	2.635 120 0.3718	2T	32.948 0.0 0.0	2.000 32.948 34.948	17.662 0.0 12.992			Vel = 23.45	
	0.0 398.52						30.654		K Factor = 71.98	
73 to 63	399.55 399.55	2.635 120 0.3736	2T	32.948 0.0 0.0	2.000 32.948 34.948	17.746 0.0 13.055			Vel = 23.51	
	0.0 399.55						30.801		K Factor = 71.99	
71 to 61	398.23 398.23	2.635 120 0.3713	2T	32.948 0.0 0.0	2.000 32.948 34.948	17.638 0.0 12.975			Vel = 23.43	
61 to 62	0.0 398.23	6.357 120 0.0051		0.0 0.0 0.0	8.000 0.0 8.000	30.613 0.0 0.041			Vel = 4.03	
62 to 63	398.51 796.74	6.357 120 0.0184		0.0 0.0 0.0	8.000 0.0 8.000	30.654 0.0 0.147			Vel = 8.05	
63 to 64	399.55 1196.29	6.357 120 0.0390	2E	35.205 0.0 0.0	74.670 35.205 109.875	30.801 0.0 4.283			Vel = 12.09	
64 to 40	0.0 1196.29	4.26 120 0.2740		0.0 0.0 0.0	1.000 0.0 1.000	35.084 0.0 0.274			Vel = 26.93	
	0.0 1196.29						35.358		K Factor = 201.18	
1 to 2	116.54 116.54	2.157 120 0.1013		0.0 0.0 0.0	12.000 0.0 12.000	39.873 0.0 1.216			Vel = 10.23	
2 to 3	0.0 116.54	2.157 120 0.1013		0.0 0.0 0.0	12.000 0.0 12.000	41.089 0.0 1.216			Vel = 10.23	
3 to 4	0.0 116.54	2.157 120 0.1013		0.0 0.0 0.0	12.000 0.0 12.000	42.305 0.0 1.216			Vel = 10.23	
4 to 20	0.0 116.54	2.157 120 0.1013	2T	24.613 0.0 0.0	51.750 24.613 76.363	43.521 0.0 7.739			Vel = 10.23	
	0.0 116.54						51.260		K Factor = 16.28	
5 to 6	108.87 108.87	2.157 120 0.0894		0.0 0.0 0.0	12.000 0.0 12.000	41.225 0.0 1.073			Vel = 9.56	
6 to 7	0.0 108.87	2.157 120 0.0893		0.0 0.0 0.0	12.000 0.0 12.000	42.298 0.0 1.072			Vel = 9.56	

Final Calculations - Standard

RESIDENTIAL FIRE PROTECTION
 Packedge addition

Page 7
 Date 7-31-13

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
7 to 8	0.0 108.87	2.157 120 0.0893		0.0	12.000 0.0	43.370 0.0				
								Vel =	9.56	
8 to 21	0.0 108.87	2.157 120 0.0893	2T	24.613	51.750 24.613 76.363	44.442 0.0 6.823				
	0.0 108.87							Vel =	9.56	
						51.265		K Factor =	15.21	
9 to 10	102.26 102.26	2.157 120 0.0796		0.0	12.000 0.0	42.339 0.0				
								Vel =	8.98	
10 to 11	0.0 102.26	2.157 120 0.0796		0.0	12.000 0.0	43.294 0.0				
								Vel =	8.98	
11 to 12	0.0 102.26	2.157 120 0.0796		0.0	12.000 0.0	44.249 0.0				
								Vel =	8.98	
12 to 22	0.0 102.26	2.157 120 0.0796	2T	24.613	51.750 24.613 76.363	45.204 0.0 6.076				
	0.0 102.26							Vel =	8.98	
						51.280		K Factor =	14.28	
40 to 1	116.54 116.54	2.157 120 0.1013	1T	12.307	32.250 12.307 44.557	35.358 0.0 4.515				
	0.0 116.54							Vel =	10.23	
						39.873		K Factor =	18.46	
41 to 5	108.87 108.87	2.157 120 0.0893	1T	12.307	32.250 12.307 44.557	37.244 0.0 3.981				
	0.0 108.87							Vel =	9.56	
						41.225		K Factor =	16.96	
42 to 9	102.26 102.26	2.157 120 0.0796	1T	12.307	32.250 12.307 44.557	38.794 0.0 3.545				
	0.0 102.26							Vel =	8.98	
						42.339		K Factor =	15.72	
23 to 43	-96.64 -96.64	2.157 120 -0.0717	3T	36.92	120.100 36.920 157.020	51.309 0.0 -11.253				
	0.0 -96.64							Vel =	8.48	
						40.056		K Factor =	-15.27	
24 to 44	-92.06 -92.06	2.157 120 -0.0655	3T	36.92	120.100 36.920 157.020	51.357 0.0 -10.287				
	0.0 -92.06							Vel =	8.08	
						41.070		K Factor =	-14.37	
25 to 45	-88.45 -88.45	2.157 120 -0.0608	3T	36.92	120.100 36.920 157.020	51.425 0.0 -9.553				
								Vel =	7.77	

Final Calculations - Standard

RESIDENTIAL FIRE PROTECTION
 Packedge addition

Page 8
 Date 7-31-13

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
	0.0 -88.45					41.872			K Factor = -13.67	
26 to 46	-85.78	2.157 120	3T	36.92 0.0	120.100 36.920	51.517 0.0				
	-85.78	-0.0575		0.0	157.020	-9.025			Vel = 7.53	
	0.0 -85.78					42.492			K Factor = -13.16	
27 to 47	-83.98	2.157 120	3T	36.92 0.0	120.100 36.920	51.635 0.0				
	-83.98	-0.0553		0.0	157.020	-8.679			Vel = 7.37	
	0.0 -83.98					42.956			K Factor = -12.81	
28 to 48	-83.00	2.157 120	3T	36.92 0.0	120.100 36.920	51.780 0.0				
	-83.0	-0.0541		0.0	157.020	-8.493			Vel = 7.29	
	0.0 -83.00					43.287			K Factor = -12.62	
29 to 49	-82.76	2.157 120	3T	36.92 0.0	120.100 36.920	51.956 0.0				
	-82.76	-0.0538		0.0	157.020	-8.448			Vel = 7.27	
	0.0 -82.76					43.508			K Factor = -12.55	
30 to 50	-83.16	2.157 120	3T	36.92 0.0	120.100 36.920	52.164 0.0				
	-83.16	-0.0543		0.0	157.020	-8.525			Vel = 7.30	
	0.0 -83.16					43.639			K Factor = -12.59	
31 to 51	-88.69	2.157 120	3T	36.92 0.0	120.100 36.920	53.303 0.0				
	-88.69	-0.0611		0.0	157.020	-9.600			Vel = 7.79	
	0.0 -88.69					43.703			K Factor = -13.42	
32 to 52	-84.11	2.157 120	3T 2E	36.92 12.307	123.625 49.227	53.301 0.0				
	-84.11	-0.0554		0.0	172.852	-9.581			Vel = 7.38	
	0.0 -84.11					43.720			K Factor = -12.72	
20 to 21	116.54	6.357 120		0.0 0.0	8.330 0.0	51.260 0.0				
	116.54	0.0006		0.0	8.330	0.005			Vel = 1.18	
21 to 22	108.87	6.357 120		0.0 0.0	8.330 0.0	51.265 0.0				
	225.41	0.0018		0.0	8.330	0.015			Vel = 2.28	
22 to 23	102.26	6.357 120		0.0 0.0	8.330 0.0	51.280 0.0				
	327.67	0.0035		0.0	8.330	0.029			Vel = 3.31	
23 to 24	96.63	6.357 120		0.0 0.0	8.330 0.0	51.309 0.0				
	424.3	0.0058		0.0	8.330	0.048			Vel = 4.29	

Final Calculations - Standard

RESIDENTIAL FIRE PROTECTION
 Packedge addition

Page 9
 Date 7-31-13

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
24	92.06	6.357			8.330	51.357				
to		120			0.0	0.0				
25	516.36	0.0082			8.330	0.068		Vel =	5.22	
25	88.45	6.357			8.330	51.425				
to		120			0.0	0.0				
26	604.81	0.0110			8.330	0.092		Vel =	6.11	
26	85.78	6.357			8.330	51.517				
to		120			0.0	0.0				
27	690.59	0.0142			8.330	0.118		Vel =	6.98	
27	83.98	6.357			8.330	51.635				
to		120			0.0	0.0				
28	774.57	0.0174			8.330	0.145		Vel =	7.83	
28	83.00	6.357			8.330	51.780				
to		120			0.0	0.0				
29	857.57	0.0211			8.330	0.176		Vel =	8.67	
29	82.76	6.357			8.330	51.956				
to		120			0.0	0.0				
30	940.33	0.0250			8.330	0.208		Vel =	9.51	
30	83.17	6.357	1T	37.72	2.916	52.164				
to		120			37.720	0.0				
60	1023.5	0.0292			40.636	1.186		Vel =	10.35	
60	-1196.29	6.357	1T	37.72	5.416	53.350				
to		120			37.720	0.0				
31	-172.79	-0.0011			43.136	-0.047		Vel =	1.75	
31	88.68	6.357			8.330	53.303				
to		120			0.0	0.0				
32	-84.11	-0.0002			8.330	-0.002		Vel =	0.85	
	0.0									
	-84.11					53.301		K Factor =	-11.52	
40	1079.75	4.26			8.330	35.358				
to		120			0.0	0.0				
41	1079.75	0.2264			8.330	1.886		Vel =	24.30	
41	-108.87	4.26			8.330	37.244				
to		120			0.0	0.0				
42	970.88	0.1861			8.330	1.550		Vel =	21.85	
42	-102.26	4.26			8.330	38.794				
to		120			0.0	0.0				
43	868.62	0.1515			8.330	1.262		Vel =	19.55	
43	-96.63	4.26			8.330	40.056				
to		120			0.0	0.0				
44	771.99	0.1217			8.330	1.014		Vel =	17.38	
44	-92.06	4.26			8.330	41.070				
to		120			0.0	0.0				
45	679.93	0.0963			8.330	0.802		Vel =	15.31	
45	-88.45	4.26			8.330	41.872				
to		120			0.0	0.0				
46	591.48	0.0744			8.330	0.620		Vel =	13.31	
46	-85.78	4.26			8.330	42.492				
to		120			0.0	0.0				
47	505.7	0.0557			8.330	0.464		Vel =	11.38	

Final Calculations - Standard

RESIDENTIAL FIRE PROTECTION
 Packedge addition

Page 10
 Date 7-31-13

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
47	-83.98	4.26	0.0	8.330	42.956				
to		120	0.0	0.0	0.0				
48	421.72	0.0397	0.0	8.330	0.331		Vel = 9.49		
48	-83.00	4.26	0.0	8.330	43.287				
to		120	0.0	0.0	0.0				
49	338.72	0.0265	0.0	8.330	0.221		Vel = 7.62		
49	-82.76	4.26	0.0	8.330	43.508				
to		120	0.0	0.0	0.0				
50	255.96	0.0157	0.0	8.330	0.131		Vel = 5.76		
50	-83.17	4.26	0.0	8.330	43.639				
to		120	0.0	0.0	0.0				
51	172.79	0.0077	0.0	8.330	0.064		Vel = 3.89		
51	-88.68	4.26	0.0	8.330	43.703				
to		120	0.0	0.0	0.0				
52	84.11	0.0020	0.0	8.330	0.017		Vel = 1.89		
	0.0								
	84.11				43.720		K Factor = 12.72		
60	1196.29	6.357	2E 35.205	74.330	53.350				
to		120	0.0	35.205	7.904				
TR	1196.29	0.0390	0.0	109.535	4.270		Vel = 12.09		
TR	0.0	6.357	1Z 17.603	19.000	65.524				
to		120	0.0	17.603	8.433		* Fixed loss = 8		
BR	1196.29	0.0390	0.0	36.603	1.427		Vel = 12.09		
BR	0.0	6.16	1T 43.037	75.000	75.384				
to		140	1G 4.304	87.509	0.0				
TEST	1196.29	0.0342	2E 40.168	162.509	5.551		Vel = 12.88		
	250.00						Qa = 250.00		
	1446.29				80.935		K Factor = 160.76		