



**. . . Fire Protection by Computer Design**

RSD FIRE PROTECTION, INC  
737 SO. CEDAR ROAD  
NEW LENOX, ILLINOIS  
815-463-9985

Job Name : 66 ORLAND SQUARE DRIVE - MRA 3  
Building : FP1  
Location : 66 ORLAND SQUARE DRIVE, ORLAND PARK, ILLINOIS  
System : MRA 3  
Contract :  
Data File : MRA 3.WXF

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**HYDRAULIC CALCULATIONS**  
*for*

**Project name:** 66 ORLAND SQUARE DRIVE - UNIT C  
**Location:** 66 ORLAND SQUARE DRIVE, ORLAND PARK, ILLINOIS  
**Drawing no:** FP1  
**Date:** 7-15-15

**Design**

**Remote area number:** MRA 3  
**Remote area location:** UNIT C  
**Occupancy classification:** ORDINARY HAZARD - GROUP 2  
**Density:** .20 - Gpm/SqFt  
**Area of application:** 1590 - SqFt  
**Coverage per sprinkler:** 130 MAX. - SqFt  
**Type of sprinklers calculated:** EXSITNG 3/4" BR UPRIGHTS, K+8.0  
**No. of sprinklers calculated:** 12  
**In-rack demand:** NA - GPM  
**Hose streams:** 250 - GPM  
**Total water required (including hose streams):** 577.36 - GPM @ 33.757 - Psi  
**Type of system:** WET  
**Volume of dry or preaction system:** NA - Gal

**Water supply information**

**Date:** 7-8-15  
**Location:** FIRE PUMP TEST ON SITE  
**Source:** ROGERS PUMP

**Name of contractor:** RSD FIRE PROTECTION, INC.  
**Address:** 737 SOUTH CEDAR ROAD, NEW LENOX, ILLINOIS 60451  
**Phone number:** 815-463-9985  
**Name of designer:** DS  
**Authority having jurisdiction:** ORLAND PARK FIRE PREVENTION BUREAU  
**Notes: (Include peaking information or gridded systems here.)**

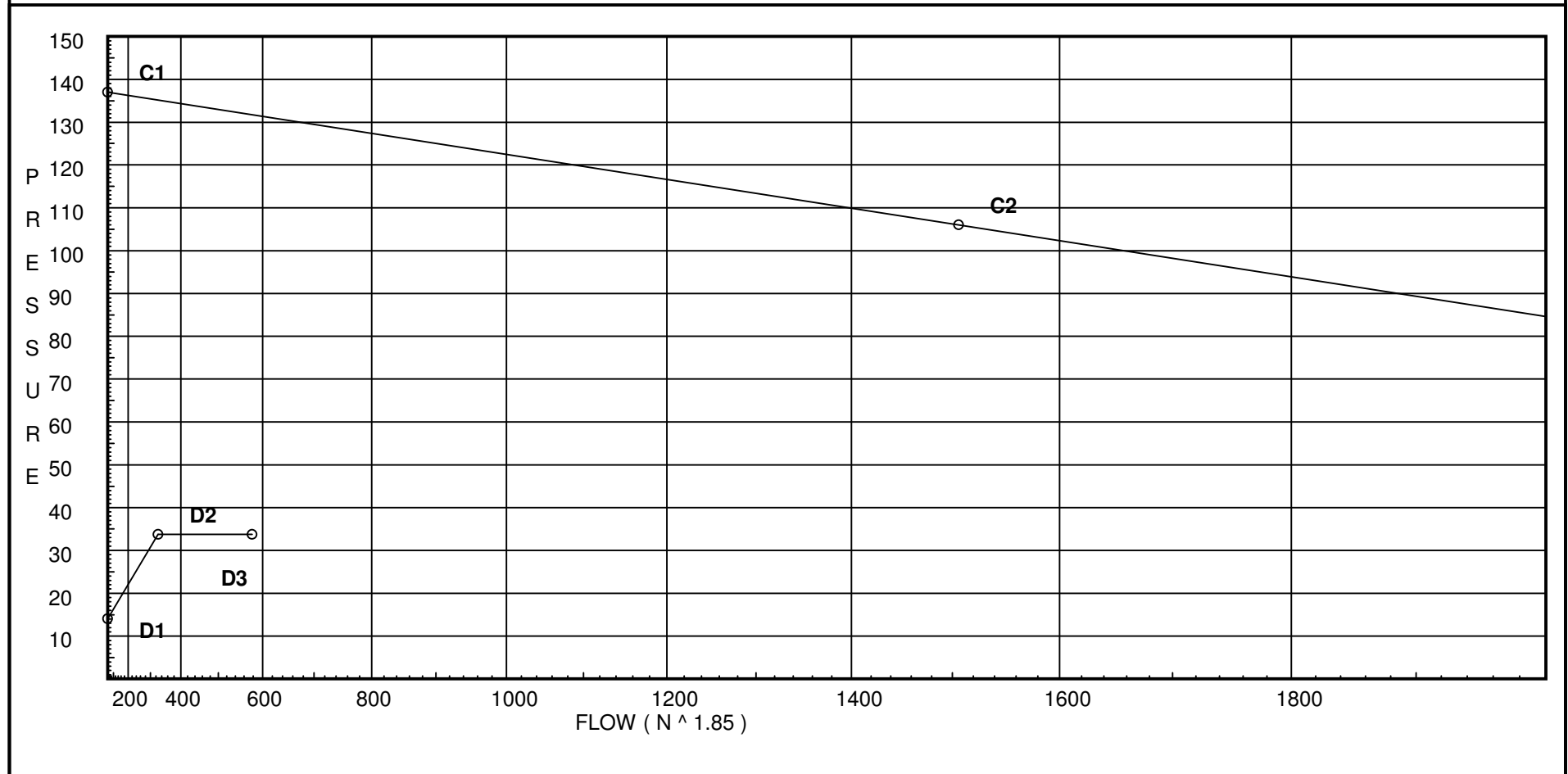
# Water Supply Curve (C)

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City Water Supply:  
C1 - Static Pressure : 137  
C2 - Residual Pressure: 106  
C2 - Residual Flow : 1506

Demand:  
D1 - Elevation : 14.076  
D2 - System Flow : 327.362  
D2 - System Pressure : 33.757  
Hose ( Demand ) : 250  
D3 - System Demand : 577.362  
Safety Margin : 97.982





# Fittings Used Summary

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## Fitting Legend

Abbrev.	Name	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8	10	12	14	16	18	20	24
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
G	NFPA 13 Gate Valve	0	0	0	0	0	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13
I	90' Grvd-Vic Elbow #10	0	0	2	3	4	3.5	6	5	8	7	8.5	10	13	17	20	23	25	33	36	40
J	90'Tee-Branch Grv Vic #20	0	0	4.5	6	8	8.5	10.8	13	17	16	21	25	33	41	50	65	78	88	98	120
S	NFPA 13 Swing Check	0	0	5	7	9	11	14	16	19	22	27	32	45	55	65					
T	NFPA 13 90' Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121
V	90' Ell Firelock #001	0	0	0	0	0	3.5	4.3	5	0	6.8	8.5	10	13	0	0	0	0	0	0	0

## Units Summary

Diameter Units                   Inches  
Length Units                       Feet  
Flow Units                         US Gallons per Minute  
Pressure Units                   Pounds per Square Inch

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with \*. The fittings marked with a \* show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a \* will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.

# Pressure / Flow Summary - STANDARD

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Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
101	32.5	8	7.5	na	21.9	0.2	107.5	7.0
102	32.5	8	7.43	na	21.81	0.2	107.5	7.0
103	32.5	8	7.43	na	21.81	0.2	107.5	7.0
104	32.5	8	7.48	na	21.88	0.2	107.5	7.0
105	32.5	8	7.67	na	22.16	0.2	107.5	7.0
106	32.5	8	7.54	na	21.96	0.2	107.5	7.0
107	32.5	8	7.47	na	21.87	0.2	107.5	7.0
108	32.5	8	7.47	na	21.87	0.2	107.5	7.0
109	32.5	8	7.52	na	21.94	0.2	107.5	7.0
110	32.5	8	7.71	na	22.22	0.2	107.5	7.0
111	32.5	8	7.36	na	21.71	0.2	107.5	7.0
112	32.5	8	7.24	na	21.53	0.2	107.5	7.0
113	32.5	8	7.22	na	21.5	0.2	107.5	7.0
114	32.5	8	7.24	na	21.52	0.2	107.5	7.0
115	32.5	8	7.34	na	21.68	0.2	107.5	7.0
7	31.0		12.23	na				
9	31.0		12.1	na				
11	31.0		12.03	na				
13	31.0		12.03	na				
15	31.0		12.02	na				
2	31.0		9.05	na				
4	31.0		9.11	na				
6	31.0		9.33	na				
8	31.0		9.52	na				
10	31.0		9.64	na				
12	31.0		9.66	na				
14	31.0		9.67	na				
1	31.0		15.07	na				
3	31.0		15.08	na				
17	31.0		15.1	na				
5	31.0		12.75	na				
TR3	31.0		15.76	na				
BR	31.0		17.04	na				
TIE	4.0		30.96	na				
TRX	31.0		19.96	na				
BRX	2.0		32.69	na	250.0			
PO	0.0		33.76	na				

The maximum velocity is 11.68 and it occurs in the pipe between nodes 17 and 5

# Final Calculations - Hazen-Williams

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftnng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
101	-23.16	2.067		0.0	10.000	7.496				
to		120.0		0.0	0.0	0.0				K Factor = 8.00
102	-23.16	-0.0063		0.0	10.000	-0.063				Vel = 2.21
102	21.81	2.067		0.0	10.000	7.433				K Factor = 8.00
to		120.0		0.0	0.0	0.0				
103	-1.35	-0.0001		0.0	10.000	-0.001				Vel = 0.13
103	21.81	2.067		0.0	10.000	7.432				K Factor = 8.00
to		120.0		0.0	0.0	0.0				
104	20.46	0.0050		0.0	10.000	0.050				Vel = 1.96
104	21.89	2.067		0.0	10.000	7.482				K Factor = 8.00
to		120.0		0.0	0.0	0.0				
105	42.35	0.0192		0.0	10.000	0.192				Vel = 4.05
105	22.16	2.067	1J	8.5	143.125	7.674				K Factor = 8.00
to		120.0	1T	10.0	18.500	0.650				
1	64.51	0.0418		0.0	161.625	6.749				Vel = 6.17
	0.0									
	64.51					15.073				K Factor = 16.62
106	-23.56	2.067		0.0	10.000	7.538				K Factor = 8.00
to		120.0		0.0	0.0	0.0				
107	-23.56	-0.0065		0.0	10.000	-0.065				Vel = 2.25
107	21.87	2.067		0.0	10.000	7.473				K Factor = 8.00
to		120.0		0.0	0.0	0.0				
108	-1.69	0.0		0.0	10.000	0.0				Vel = 0.16
108	21.87	2.067		0.0	10.000	7.473				K Factor = 8.00
to		120.0		0.0	0.0	0.0				
109	20.18	0.0049		0.0	10.000	0.049				Vel = 1.93
109	21.94	2.067		0.0	10.000	7.522				K Factor = 8.00
to		120.0		0.0	0.0	0.0				
110	42.12	0.0189		0.0	10.000	0.189				Vel = 4.03
110	22.22	2.067	1J	8.5	143.125	7.711				K Factor = 8.00
to		120.0	1T	10.0	18.500	0.650				
3	64.34	0.0416		0.0	161.625	6.716				Vel = 6.15
	0.0									
	64.34					15.077				K Factor = 16.57
111	-33.40	2.067		0.0	10.000	7.364				K Factor = 8.00
to		120.0		0.0	0.0	0.0				
112	-33.4	-0.0123		0.0	10.000	-0.123				Vel = 3.19
112	21.53	2.067		0.0	10.000	7.241				K Factor = 8.00
to		120.0		0.0	0.0	0.0				
113	-11.87	-0.0018		0.0	10.000	-0.018				Vel = 1.13
113	21.50	2.067		0.0	10.000	7.223				K Factor = 8.00
to		120.0		0.0	0.0	0.0				
114	9.63	0.0012		0.0	10.000	0.012				Vel = 0.92
114	21.51	2.067		0.0	10.000	7.235				K Factor = 8.00
to		120.0		0.0	0.0	0.0				
115	31.14	0.0109		0.0	10.000	0.109				Vel = 2.98
115	21.68	2.067	1J	8.5	146.458	7.344				K Factor = 8.00
to		120.0	1T	10.0	18.500	0.650				
5	52.82	0.0288		0.0	164.958	4.759				Vel = 5.05

# Final Calculations - Hazen-Williams

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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 52.82									
						12.753			K Factor = 14.79	
101 to 2	45.06 45.06	2.067 120.0 0.0215	1J 1T	8.5 10.0 0.0	23.750 18.500 42.250	7.496 0.650 0.908				Vel = 4.31
	0.0 45.06									
						9.054			K Factor = 14.98	
106 to 4	45.52 45.52	2.067 120.0 0.0219	1J 1T	8.5 10.0 0.0	23.750 18.500 42.250	7.538 0.650 0.926				Vel = 4.35
	0.0 45.52									
						9.114			K Factor = 15.08	
111 to 6	55.11 55.11	2.067 120.0 0.0312	1J 1T	8.5 10.0 0.0	23.750 18.500 42.250	7.364 0.650 1.319				Vel = 5.27
	0.0 55.11									
						9.333			K Factor = 18.04	
7 to 8	-30.75 -30.75	2.067 120.0 -0.0106	2J 2T	17.0 20.0 0.0	218.208 37.000 255.208	12.225 0.0 -2.705				Vel = 2.94
	0.0 -30.75									
						9.520			K Factor = -9.97	
9 to 10	-29.23 -29.23	2.067 120.0 -0.0097	2J 2T	17.0 20.0 0.0	218.208 37.000 255.208	12.105 0.0 -2.465				Vel = 2.79
	0.0 -29.23									
						9.640			K Factor = -9.41	
11 to 12	-28.66 -28.66	2.067 120.0 -0.0093	2J 2T	17.0 20.0 0.0	218.208 37.000 255.208	12.035 0.0 -2.376				Vel = 2.74
	0.0 -28.66									
						9.659			K Factor = -9.22	
13 to 14	-28.54 -28.54	2.067 120.0 -0.0092	2J 2T	17.0 20.0 0.0	218.208 37.000 255.208	12.026 0.0 -2.358				Vel = 2.73
	0.0 -28.54									
						9.668			K Factor = -9.18	
15 to 16	-28.51 -28.51	2.067 120.0 -0.0092	2J 2T	17.0 20.0 0.0	218.208 37.000 255.208	12.023 13.426 -2.352				Vel = 2.73
	0.0 -28.51									
						23.097			K Factor = -5.93	
2 to 4	45.06 45.06	2.635 120.0 0.0066		0.0 0.0 0.0	9.125 0.0 9.125	9.054 0.0 0.060				Vel = 2.65
4 to 6	45.52 90.58	2.635 120.0 0.0240		0.0 0.0 0.0	9.125 0.0 9.125	9.114 0.0 0.219				Vel = 5.33



# Final Calculations - Hazen-Williams

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Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
6	55.11	3.26		0.0	9.125	9.333				
to		120.0		0.0	0.0	0.0				
8	145.69	0.0205		0.0	9.125	0.187		Vel =	5.60	
8	-30.75	3.26		0.0	9.125	9.520				
to		120.0		0.0	0.0	0.0				
10	114.94	0.0132		0.0	9.125	0.120		Vel =	4.42	
10	-29.23	4.26		0.0	9.083	9.640				
to		120.0		0.0	0.0	0.0				
12	85.71	0.0021		0.0	9.083	0.019		Vel =	1.93	
12	-28.66	4.26		0.0	9.125	9.659				
to		120.0		0.0	0.0	0.0				
14	57.05	0.0010		0.0	9.125	0.009		Vel =	1.28	
14	-28.54	4.26		0.0	9.125	9.668				
to		120.0		0.0	0.0	13.426				
16	28.51	0.0003		0.0	9.125	0.003		Vel =	0.64	
	0.0									
	28.51					23.097		K Factor =	5.93	
1	64.51	5.295		0.0	9.125	15.073				
to		120.0		0.0	0.0	0.0				
3	64.51	0.0004		0.0	9.125	0.004		Vel =	0.94	
3	64.33	5.295	1V	10.737	5.250	15.077				
to		120.0		0.0	10.737	0.0				
17	128.84	0.0015		0.0	15.987	0.024		Vel =	1.88	
17	-327.36	2.635	1T	16.474	6.458	15.101				
to		120.0		0.0	16.474	0.0				
5	-198.52	-0.1024		0.0	22.932	-2.348		Vel =	11.68	
5	52.83	2.635		0.0	9.125	12.753				
to		120.0		0.0	0.0	0.0				
7	-145.69	-0.0579		0.0	9.125	-0.528		Vel =	8.57	
7	30.75	3.26		0.0	9.125	12.225				
to		120.0		0.0	0.0	0.0				
9	-114.94	-0.0132		0.0	9.125	-0.120		Vel =	4.42	
9	29.23	3.26		0.0	9.125	12.105				
to		120.0		0.0	0.0	0.0				
11	-85.71	-0.0077		0.0	9.125	-0.070		Vel =	3.29	
11	28.66	4.26		0.0	9.125	12.035				
to		120.0		0.0	0.0	0.0				
13	-57.05	-0.0010		0.0	9.125	-0.009		Vel =	1.28	
13	28.54	4.26		0.0	9.125	12.026				
to		120.0		0.0	0.0	0.0				
15	-28.51	-0.0003		0.0	9.125	-0.003		Vel =	0.64	
	0.0									
	-28.51					12.023		K Factor =	-8.22	
17	327.36	4.26	1V	8.954	17.333	15.101				
to		120.0		0.0	8.954	0.0				
TR3	327.36	0.0249		0.0	26.287	0.655		Vel =	7.37	
TR3	0.0	4.26	1B	15.8	27.000	15.756				
to		120.0	1V	8.954	24.754	0.0				
BR	327.36	0.0249		0.0	51.754	1.289		Vel =	7.37	

# Final Calculations - Hazen-Williams

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Hyd. Ref. Point	Qa  Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
BR to TIE	0.0 327.36	4.26 120.0 0.0249	2V 1T	17.907 26.334 0.0	44.833 44.241 89.074	17.045 11.694 2.217		Vel =	7.37	
TIE to TRX	0.0 327.36	6.357 120.0 0.0035	1I	12.573 0.0 0.0	183.792 12.573 196.365	30.956 -11.694 0.697		Vel =	3.31	
TRX to BRX	0.0 327.36	6.357 120.0 0.0035	1E 1G	17.603 3.772 0.0	27.000 21.375 48.375	19.959 12.560 0.171		Vel =	3.31	
BRX to PO	250.00 577.36	7.981 120.0 0.0034	1G 1S	4.0 45.0 0.0	11.000 49.000 60.000	32.690 0.866 0.201		Qa =	250	
	0.0 577.36									
						33.757		K Factor =	99.37	