Understanding the HydraCALC Printout

V1.3 - October 2018

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Understanding the HydraCALC Printout

The standard HydraCALC printout conforms to NFPA13 specifications. There are alternate printout options available, but what follows are the standard sheets and their explanation.

Cover Sheet

The Cover Sheet begins the submittal calculations. It consists of a logo, your company information (if so configured) and some pertinent calculation information. The version number of HydraCALC used to produce the calculation is at bottom.

Hydraulic calculations using HydraCALC

Hydratec Incorporated
64 Haverhill Road
Route 111
Windham, NH 03087
603-434-0502

Job Name	:	Grid Test
Drawing	:	1 of 3
Location	:	42 NW 65th Street
Remote Area	:	1
Contract	:	999456
Data File	:	Hydratec Example Grid.wxf

Computer Programs by Hydratec Inc. Revision: 50.53.5

The **logo** of this sheet can be changed by the user

The **company name and address** can be changed by the user

Hydratec Incorporated
64 Haverhill Road
Route 111
Windham, NH 03087
603-434-0502

The bottom section is automatically filled out and gets its values from the Information Sheet, except for the last item - the **Data File**. That is the file name of the calculation.

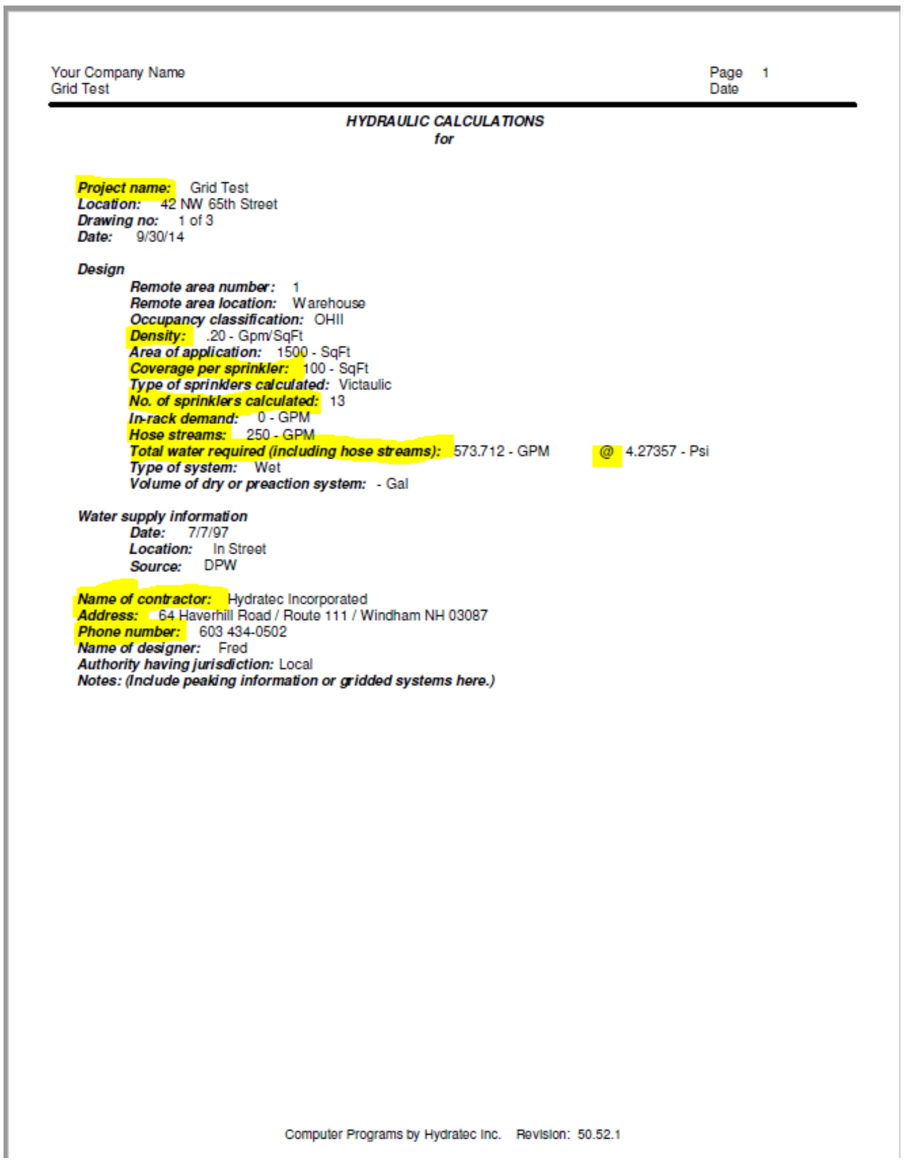
Job Name	:	Grid Test
Drawing	:	1 of 3
Location	:	42 NW 65th Street
Remote Area	:	1
Contract	:	999456
Data File	:	Hydratec Example Grid.wxf

Summary (Information) Sheet

The Summary Sheet is based on the Information Sheet that the user created in HydraCALC, if they created one.

Certain values can be automatically filled in from the calculation and from default settings in the program. These are noted below using highlighting. These items may be changed by the user.

The **Total water required** and **Psi** are the values calculated at the supply point. These can, however, be numbers the user chooses to use at another point. The **Water Supply/Hydraulic Graph** and **Hydraulic Calculation Sheets** should be used to determine this information, not this Summary Sheet.



Your Company Name
Grid Test

Page 1
Date

HYDRAULIC CALCULATIONS
for

Project name: Grid Test
Location: 42 NW 65th Street
Drawing no: 1 of 3
Date: 9/30/14

Design
Remote area number: 1
Remote area location: Warehouse
Occupancy classification: OHII
Density: .20 - Gpm/SqFt
Area of application: 1500 - SqFt
Coverage per sprinkler: 100 - SqFt
Type of sprinklers calculated: Victaulic
No. of sprinklers calculated: 13
In-rack demand: 0 - GPM
Hose streams: 250 - GPM
Total water required (including hose streams): 573.712 - GPM @ 4.27357 - Psi
Type of system: Wet
Volume of dry or preaction system: - Gal

Water supply information
Date: 7/7/97
Location: In Street
Source: DPW

Name of contractor: Hydratec Incorporated
Address: 64 Haverhill Road / Route 111 / Windham NH 03087
Phone number: 603 434-0502
Name of designer: Fred
Authority having jurisdiction: Local
Notes: (Include peaking information or gridded systems here.)

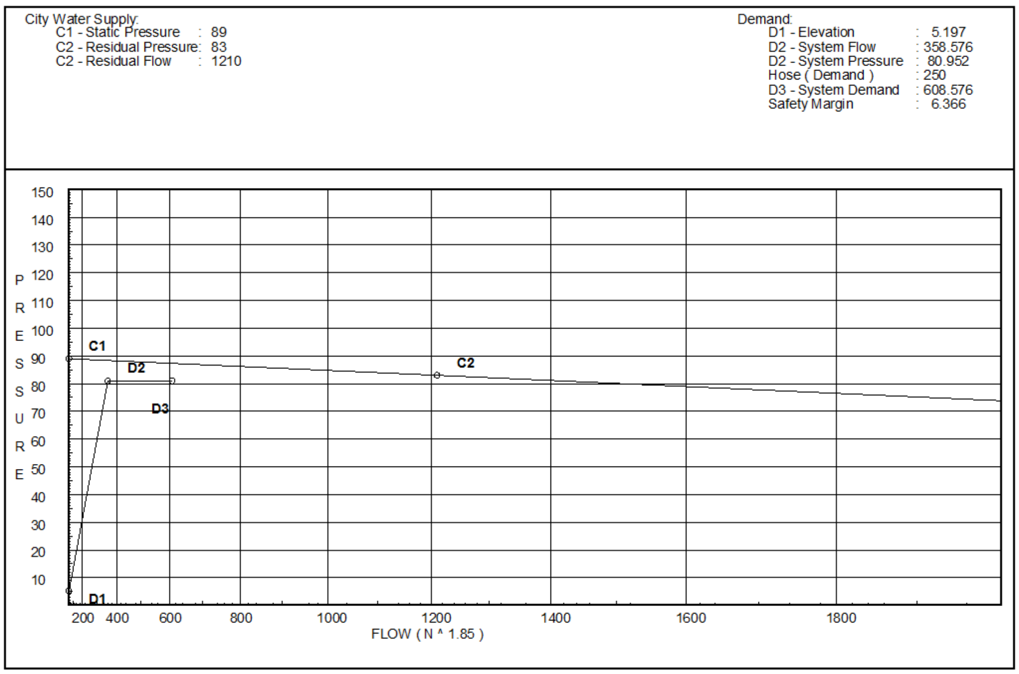
Computer Programs by Hydratec Inc. Revision: 50.52.1

Water Supply (Hydraulic Graph)

The **Hydraulic Graph** sheet is generated from the data that was entered using the Water Supplies command along with data entered into the job itself. It shows curves based on city supplies and pumps, if any. This page prints in landscape mode.

Types of Hydraulic Graphs

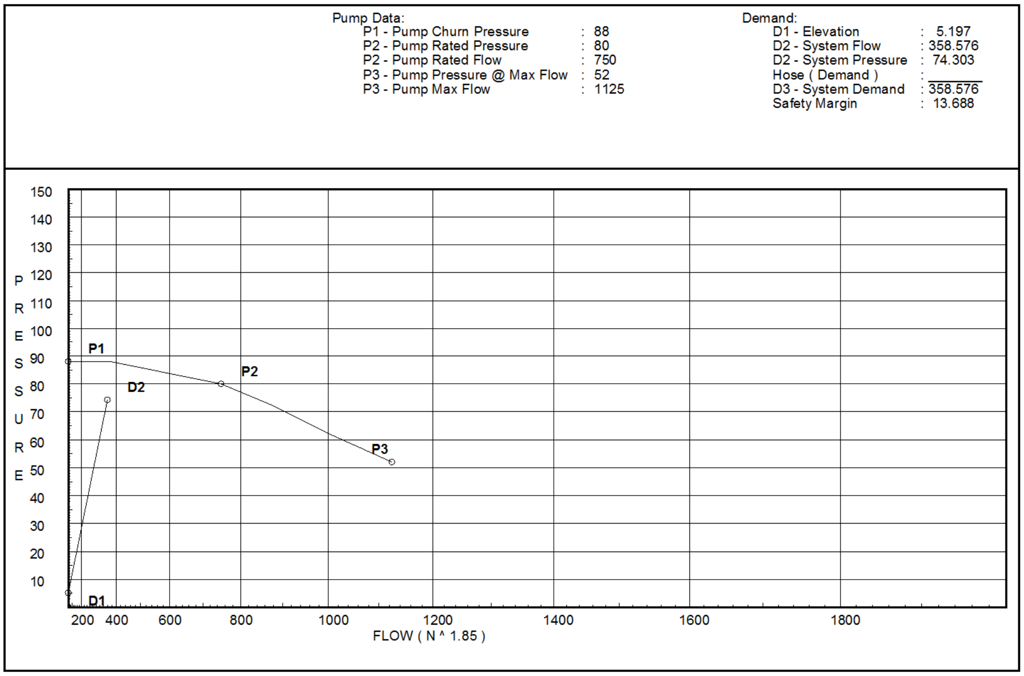
The following represent the three most common Hydraulic Graphs.



City Supply Only

This graph shows two curves, the **City** curve and the **Demand** curve. The demand curve (in this case) has two demand points at the same pressure – D2 and D3. This is because the exterior hose flow was added as an H250 flow. This allow this flow to be seen clearly. If the flow were entered as +250, the numerical result is the same, but the Demand curve is drawn directly from D1 to D2, where D2 takes the place of D3 and no D3 is shown.

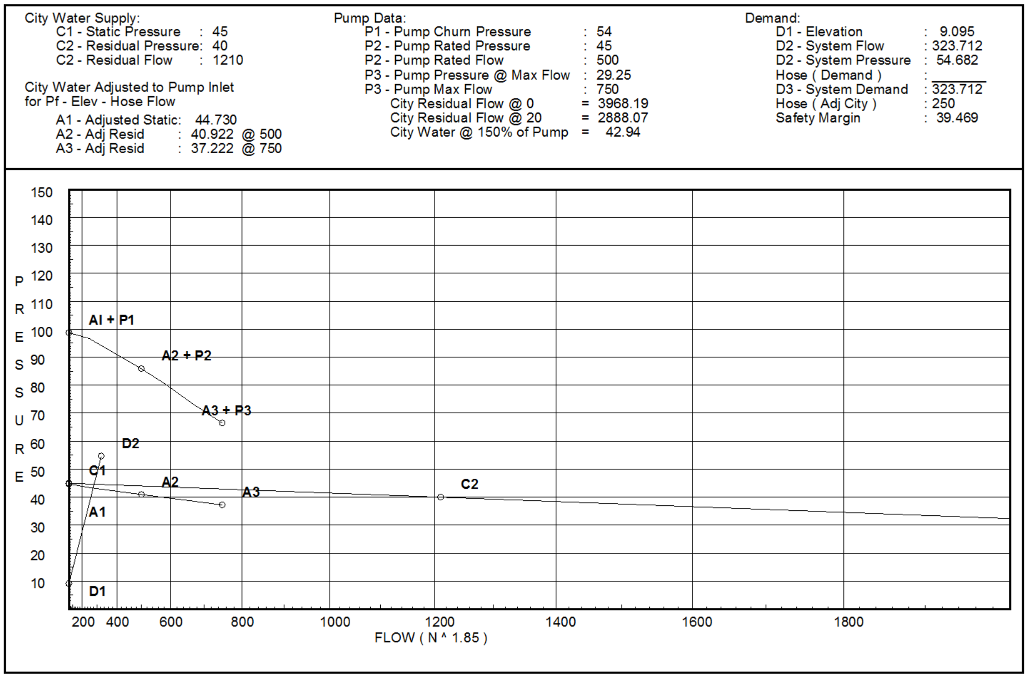
See below for a key to the points and what they represent.



Pump Supply Only (No City Supply)

This graph shows two curves, the **Pump** curve and the **Demand** curve. The Pump curve is drawn using the Churn Pressure, the Rated Pressure and the Rated Flow.

See below for a key to the points and what they represent.



Pump and City Supply

This graph shows four curves, the **City** curve, the **Adjusted City** curve, the combined **Pump and Adjusted City** curve and the **Demand** curve. The straight pump curve is omitted for clarity. The Adjusted City curve is calculated by flowing the various points along the pump curve from the **Source** back to the **Pump Inlet**. Any elevation changes, hose flows or friction losses are accounted for, usually resulting in a lower water pressure being available at the Pump Inlet versus the Source point.

The Adjusted City curve plus the Pump curve adds together these two curves, resulting in the water actually available.

See below for a key to the points and what they represent.

Key to Hydraulic Graph

The following table presents where the values on the graph come from, along with notes explaining in detail, if necessary.

Some of these curves appear only if a pump is present, or a city supply is entered, or both.

Hydraulic Graph Key					
Point	**Source**	**City**	**Pump**	**City and Pump**	**Notes**
C1	Water Source	X			Static Pressure as specified in Water Source input
C2	Water Source	X			Residual Pressure as specified in Water Source input
C2	Water Source	X			Residual Flow as specified in Water Source input
A1	Calculated			X	Adjusted Static is calculated from the losses in elevation and friction between the pump inlet and the water source itself, resulting in, usually, a lower available pressure at the pump inlet. Hose flows between the source point and the pump inlet also affect this result
A2	Water Source			X	This is the Adjusted Residual at the pump rated flow
A3	Water Source			X	This is the Adjusted Residual at 150% of the pump rated flow
P1	Water Source		X	X	Pump Rated Pressure times the Churn Percentage
P2	Water Source		X	X	Pump Rated Pressure as specified in the Water Source input
P2	Water Source		X	X	Pump Rated Flow as specified in the Water Source input
P3	Water Source		X	X	Pump Pressure at 150% of Rated Flow
P3	Water Source		X	X	150% of Pump rated Flow
D1	Input	X	X		Calculated from input. Difference between highest and lowest elevations, converted to PSI/Bar
D2	Calculated	X	X		The flow required by the system as calculated. Does not include Hose (H) flows
D3	Calculated	X			This point only appears on graph if a flow is added using an ‘H’ before it, i.e. H250, H1000. The line between D2 and D3 represents the flow magnitude of the flow

These additional values appear on the Hydraulic Graph for information purposes:

Value	Notes
City Residual Flow @0	Flow from city curve at zero psi
City Residual Flow @20	Flow from city curve at 20 psi
City Water @ 150% of Pump	Flow from city curve at 150% of the pump rated flow
Hose (Demand)	Hose added at the demand point of the calculation
Hose (Adj City)	Hose figured into Adjusted City Curve calculations (Points A1 and A2)
Safety Margin	The ‘cushion’ resulting from the calculation. This number references the difference between D2 (or D3) and the city, pump or combined curve

Fittings Used Summary

This report shows detailed information concerning the **fittings** that are used in the calculation. In the image below, note five fittings – A, E, G, T and Zac, that were used somewhere in the calculation.

The **Name** of the fitting is printed after the **Fitting Abbreviation**. After that appear the equivalent lengths that are assigned to all the sizes possible in HydraCALC, from ½" (12mm) to 24" (600mm). These are the '**unadjusted'** equivalent lengths. Certain NFPA standards require that the fittings lengths be **adjusted** based on the pipe type and c-factor used - a note to this effect appears at the bottom of this page. These adjusted lengths are used on the hydraulic calculation sheets (later in this chapter). This part of the report is useful in that it shows what the equivalent lengths were before those adjustments.

The **Zac** fitting's values are based on a **loss curve** as opposed to a table, hence the note next to it.

Fittings Used Summary

Hydratec Incorporated
Example Tree

Page 3
Date 6/12/12

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
A	Alarm Rel E1 & E3							7.7	21.5		17		27	29							
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
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
Zac	Ames 2000SS	Fitting generates a Fixed Loss Based on Flow																			

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.

The units used in the calculation are stated in the Units Summary, below the Fitting Legend.

Flow Summary (Supply and Node Analysis Sheet)

This report lists all supply sources and nodes for the calculation.

The **Supply Analysis** shows both a **pump source** and a **city source**, if present. These are defined via the Water Source command. The **Available Pressure**, **Total Demand** and **Required Pressure** columns are filled out for both pump and city sources. **Static** and **Residual** pressures and residual **Flow** are displayed for city sources. A pump, if used, does not record a static and residual pressure, instead that information is displayed on the Hydraulic Graph.

Flow Summary - NFPA

Hydratec Incorporated
Example Tree with Pump

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Date 4/4/12

SUPPLY ANALYSIS

Node at Source	Static Pressure	Residual Pressure	Flow	Available Pressure	Total Demand	Required Pressure
PO	See Information on Pump Curve			97.811	353.3	73.594
TEST	45.0	40	1210.0	43.62	603.3	43.62

NODE ANALYSIS

Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node	Notes
H1	10.0	5.6	7.0	14.82	
H2	9.0		7.88		
1	12.0	5.6	19.93	25.0	
2	12.0	5.6	21.9	26.2	
3	12.0	5.6	23.84	27.34	
4	12.0	5.28	28.14	28.0	K=K @ H2
5	12.0	5.28	35.7	31.53	K=K @ H2
6	12.0		40.31		
11	12.0	5.6	19.98	25.03	
12	12.0	5.6	21.95	26.24	
13	12.0	5.6	23.9	27.38	
14	12.0	5.6	28.21	29.74	
15	12.0	5.6	36.01	33.61	
16	12.0		40.87		
24	12.0	5.6	42.22	36.39	
25	12.0	5.6	43.26	36.83	
26	12.0		44.68		
7	11.0		42.62		
17	11.0		43.28		
27	11.0		45.7		
TOR	11.0		63.99		
BASE	0.0		73.21		
PO	0.0		73.59		
PI	0.0		42.82		
HOSE	0.0		43.21	250.0	
TEST	0.0		43.62		

The **Node Analysis** lists all the nodes in the calculation. **Elevations** are listed for each node. The **Node Type** lists **K-Factors** added at the node point. The **Pressure at Node** is the pressure at that node, and the **Discharge at Node** is the flow calculated at the node. **Hose flows** appear in this column - note the 250.0 at node HOSE.

The **Notes** column is used for various information. The most common one concerns **Equivalent K-Factors**. Nodes **4** and **5**, above, list a note 'K=K @ H2'. This means the k-factor used at both nodes resulted from the k-factor generated at node H2.

Hydraulic Calculation Sheets

The **Hydraulic Calculation Sheets** are, perhaps, the most iconic of the reports. There are many numbers and codes on this report, so explaining it will require a few pages. The item numbers in the table correspond to the item numbers found in **NFPA13** for this particular report. Certain items are added by HydraCALC for clarity when a **pump** is involved. These follow the required items.

Hazen Williams Calculation with or without a Pump

Final Calculations : Hazen-Williams

Hydratec Incorporated
Example Tree with Pump

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Date 4/4/12

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	 Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	******* Notes ******
(2)	(3)	(4)	(5)	(7)						
H1	10	5.60	14.82	1	T	5.0	1.000	(13) 120	7.000	
to				(8)			5.000	(16)	0.433	
H2	9		14.82	1.049		0.0	6.000	(14) 0.0747	0.448	Vel = 5.50
			0.0							
H2			14.82						7.881	K Factor = 5.28
1	12	5.60	25.00	1		0.0	10.000	120	19.930	
to						0.0	0.0		0.0	
2	12		25.0	1.049		0.0	10.000	0.1966	1.966	Vel = 9.28
2	12	5.60	26.20	1.25		0.0	10.000	120 (15)	21.896	
to			(6)			0.0	0.0		0.0	
3	12		51.2	1.38		0.0	10.000	0.1948 (17)	1.948	Vel = 10.98
3	12	5.60	27.35	1.25		0.0	10.000	120	23.844	
to						0.0	0.0		0.0	
4	12		78.55	1.38		0.0	10.000	0.4300	4.300	Vel = 16.85
4	12	5.28	28.00	1.25		0.0	10.000	120	28.144	K = K @ H2 (19e)
to						0.0	0.0		0.0	
5	12		106.55	1.38		0.0	10.000	0.7558	7.558	Vel = 22.86
5	12	5.28	31.53	1.5	E	4.0	4.000	120	35.702	K = K @ H2
to						0.0	4.000		0.0	
6	12		138.08	1.61		0.0	8.000	0.5764	4.611	Vel = 21.76
6	12		0.0	2	T (9)	10.0	(10) 1.000	120	40.313	
to						0.0	(11) 10.000		0.433	
7	11		138.08	2.067		0.0	(12) 11.000	0.1707	1.878	Vel = 13.20
			0.0							
7			138.08						42.624	K Factor = 21.15
11	12	5.60	25.03	1		0.0	10.000	120	19.978	
to						0.0	0.0		0.0	
12	12		25.03	1.049		0.0	10.000	0.1971	1.971	Vel = 9.29
12	12	5.60	26.24	1.25		0.0	10.000	120	21.949	
to						0.0	0.0		0.0	
13	12		51.27	1.38		0.0	10.000	0.1953	1.953	Vel = 11.00
13	12	5.60	27.37	1.25		0.0	10.000	120	23.902	
to						0.0	0.0		0.0	
14	12		78.64	1.38		0.0	10.000	0.4309	4.309	Vel = 16.87
14	12	5.60	29.75	1.25		0.0	10.000	120	28.211	
to						0.0	0.0		0.0	
15	12		108.39	1.38		0.0	10.000	0.7801	7.801	Vel = 23.25
15	12	5.60	33.60	1.5	E	4.0	4.000	120	36.012	
to						0.0	4.000		0.0	
16	12		141.99	1.61		0.0	8.000	0.6069	4.855	Vel = 22.38
16	12		0.0	2	T	10.0	1.000	120	40.867	
to						0.0	10.000		0.433	
17	11		141.99	2.067		0.0	11.000	0.1798	1.978	Vel = 13.58
			0.0							
17			141.99						43.278	K Factor = 21.58
24	12	5.60	36.39	1.25		0.0	10.000	120	42.222	
to						0.0	0.0		0.0	
25	12		36.39	1.38		0.0	10.000	0.1036	1.036	Vel = 7.81
27	11		73.22	2.5	2E	16.474	45.000	120	45.698	
to						0.0	16.474		0.0	
TOR	11		353.3	2.635		0.0	61.474	0.2975	18.289	Vel = 20.79
TOR	11		0.0	3	A	28.895	12.000	120	63.987	
to					G	1.344	30.239		8.324	* * Fixed Loss = 3.56 (19f)
BASE	0		353.3	3.26	Zac	0.0	42.239	0.1055	4.457	Vel = 13.58

Hydraulic Calculation Key (Required)	
Item #	**Name**
(2)	Hydraulic Reference Point (Node)
(3)	Elevation
(4)	Sprinkler K Factor
(5)	Flow (Qa)
(6)	Total Flow (Qt)
(7)	Nominal Pipe Size
(8)	Actual Pipe Size
(9)	Quantity and Length of each Type of Fitting and Device
(10)	Pipe Length
(11)	Equiv. Pipe Length
(12)	Total of Pipe plus Equiv Length
(13)	C-Factor
(14)	Friction Loss per Unit Pipe (Pf/ft)
(15)	Sum of Pressures from Previous Step (Pt)
(16)	Elevation Head (Pe)
(17)	Total Friction Loss (Pf)
(19a)	Velocity Pressure/Normal Pressure
(19e)	Combined K-factor Calculations
(19f)	Pressure Assigned to Backflow Device

Hazen Williams Calculation with a Pump

BASE	0		0.0	6	3E	52.808	4.000	120	76.768	
to					T	37.72	90.528		0.0	
PO	0		353.3	6.357		0.0	94.528	0.0041	0.386	Vel = 3.57
			0.0							
PO			353.30						77.154	K Factor = 40.22
System Demand Pressure									77.154	(A)
Safety Margin									20.657	(B)
Continuation Pressure									97.811	(C)
Pressure @ Pump Outlet									97.811	(C)
Pressure From Pump Curve									-54.991	(D)
Pressure @ Pump Inlet									42.820	(E)
PI	0		0.0	6	E	20.084	45.000	140	42.820	
to					T	43.037	63.121		0.0	
HOSE	0		353.3	6.16		0.0	108.121	0.0036	0.387	Vel = 3.80
HOSE	0	H250	250.00	8	T	55.354	125.000	140	43.207	
to						0.0	55.354		0.0	
TEST	0		603.3	8.27		0.0	180.354	0.0023	0.414	Vel = 3.60
			0.0							
TEST			603.30						43.621	K Factor = 91.35

Looking at the printout above, we can see the following:

The **System Demand** at the pump outlet is **77.154** (psi)
The **Safety Margin** is **20.657**
The **Continuation Pressure** (the safety margin plus the demand at the pump outlet) is **97.811**. This item is something of an accounting measure, to show consistency as numbers are carried forward
The **Pressure at Pump Outlet** is simply the Continuation Pressure carried down to the pump section
The **Pressure From Pump Curve** shows **-54.991**. This is listed as a negative because it 'removes' that much pressure from the demand on the city supply
The **Pressure at Pump Inlet** (**42.820**) is what is needed from the city supply at the pump inlet. If you follow that 42.820 back to the test point, you will end up at the **43.621** psi that is ultimately required from the city supply, after accounting for friction loss, elevation changes and valve and fitting losses

Occasionally the **Press @ Pump Inlet** may show as a negative value as well:

System Demand Pressure	41.830
Safety Margin	53.952
Continuation Pressure	95.782
Pressure @ Pump Outlet	95.782
Pressure From Pump Curve	-100.291
Pressure @ Pump Inlet	-4.509

This is because the Pump is able to handle the pressure required by the system without any pressure contribution from the City supply.

Hydraulic Calculation Key (Pump Info)		
Item	**Name**	**Note**
(A)	System Demand Pressure	Pressure required by the system up to the pump outlet (PO)
(B)	Safety Margin	This can be a positive or negative – A cushion or a deficit
(C)	Continuation Pressure / Pressure @ Pump Outlet	Demand Pressure plus Safety Margin
(D)	Pressure from Pump Curve	Contribution Pump is making. Negative designator indicates pump is contributing pressure required by system
(E)	Pressure from Pump Inlet	Pressure city supply is delivering at pump inlet (PI)

Velocity Pressure Calculations

Final Calculations : Hazen-Williams

Hydratec Incorporated
FIRE_PROTECTION_#48

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Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqiv	 Len	Pipe Ftngs Total	Pt Pe Pf	Pt Pv (19a) Pn	******* Notes ******
124	0.0	1.049	E	2.0	0.790	9.129		
to		120.0		0.0	2.000	0.0		
125	17.16	0.0978		0.0	2.790	0.273		Vel = 6.37
125	0.0	1.38		0.0	10.000	9.402		
to		120.0		0.0	0.0	0.371		* Vel Press = 0.371
120	17.16	0.0258		0.0	10.000	0.258		Vel = 3.68
	0.0							
	17.16					10.031		K Factor = 5.42
126	26.47	1.049	E	2.0	1.380	22.337		K Factor = 5.60
to		120.0		0.0	2.000	-0.598		
127	26.47	0.2186		0.0	3.380	0.739		Vel = 9.83
127	0.0	1.38	T	6.0	2.280	22.478		
to		120.0		0.0	6.000	2.591		* Vel Press = 2.591 (19a)
105	26.47	0.0576		0.0	8.280	0.477		Vel = 5.68
	0.0							
	26.47					25.546		K Factor = 5.24
128	28.64	1.049	E	2.0	1.370	26.153		K Factor = 5.60
to		120.0		0.0	2.000	-0.593		
129	28.64	0.2528		0.0	3.370	0.852		Vel = 10.63
129	0.0	1.38	T	6.0	2.280	26.412		
to		120.0		0.0	6.000	1.439		* Vel Press = 1.443
106	28.64	0.0664		0.0	8.280	0.550		Vel = 6.14
	0.0							
	28.64					28.401		K Factor = 5.37
108	-59.36	3.26		0.0	0.260	34.722	34.722 (19a)	
to		120.0		0.0	0.0	-0.154	0.035	* Vel Press = -0.154
139	-59.36	-0.0038		0.0	0.260	-0.001	34.687	Vel = 2.28
	0.0							
	-59.36					34.567		K Factor = -10.10

Velocity Pressure calculations have additional information, as needed. Some items in the report have been moved around to make room for the required column.

Hydraulic Calculation Key (Required)	
Item #	**Name**
(19a)	Velocity Pressure/Normal Pressure

Darcy-Weisbach Calculations

Final Calculations - Darcy-Weisbach

Hydratec Inc. Page 4
Antifreeze Loop Example - 1 - Using Darcy Weisbach & Hazen-Williams Date 04/16/08

Darcy Weisbach Summary Info
Fluid Density = 67.7 lbs/ft^3
Fluid Viscosity = 180 centipoise

Abbreviation Summary
E = Absolute Roughness = In.
Re = Reynolds Number
E/D = Relitive Roughness
Ff = Friction Factor
1E+3 = 1 x 10^3 = 1000

Hyd. Ref. Point	Qa / Qt	Dia. / "E" / Pf/Ft	Fitting or Eqv.	Ln.	Pipe / Ftng's / Total	Pt / Pe / Pf	Re (19g) / E/D / Ff (19g)	******* Notes ******
*ANTIFREEZE LOOP LINE 1								
1	15.00	1.61		0.0	10.000	7.716	1.773E+2	K Factor = 5.40
to		0.00400		0.0	0.0	0.000000	0.00248	
2	15.0	0.1097		0.0	10.000	1.097	0.36072	Vel = 2.36
2	16.03	1.61		0.0	10.000	8.813	3.668E+2 (19g)	K Factor = 5.40
to		0.00400		0.0	0.0	0.000000	0.00248	
3	31.03	0.2269		0.0	10.000	2.269	0.17432 (19g)	Vel = 4.89
3	17.98	1.61		0.0	10.000	11.082	5.793E+2	K Factor = 5.40
to		0.00400		0.0	0.0	0.000000	0.00248	
4	49.01	0.3585		0.0	10.000	3.585	0.11040	Vel = 7.72
4	20.68	2.067	1T	10.0	9.000	14.667	6.416E+2	K Factor = 5.40
to		0.00400		0.0	10.000	0.000000	0.00193	
5	69.69	0.1876		0.0	19.000	3.564	0.09968	Vel = 6.66
	0.0							
	69.69					18.231		K Factor = 16.32
7	22.12	1.61	1T	8.0	1.000	16.775	2.614E+2	K Factor = 5.40
to		0.00400		0.0	8.000	0.000000	0.00248	
5	22.12	0.1618		0.0	9.000	1.456	0.24467	Vel = 3.49
5	69.69	2.067	1T	10.0	1.000	18.231	8.453E+2	
to		0.00400		0.0	10.000	0.471	0.00193	
6	91.81	0.2472		0.0	11.000	2.719	0.07568	Vel = 8.78
	0.0							
	91.81					21.421		K Factor = 19.84
*ANTIFREEZE LOOP LINE 2								
11	15.22	1.61		0.0	10.000	7.942	1.799E+2	K Factor = 5.40
to		0.00400		0.0	0.0	0.000000	0.00248	
12	15.22	0.1113		0.0	10.000	1.113	0.35555	Vel = 2.40

Darcy-Weisbach Calculations use different formulas than Hazen-Williams. Additional information is included in the printout.

Hydraulic Calculation Key (Required)	
Item #	**Name**
(19g)	Friction factor and Reynold's number

AutoPeaking Summary

NFPA requires peaking information if a computer program performed the peaking. The following report contains that information.

AutoPeaking Summary

Hydratec Incorporated
Grid Test

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Date

Auto Peaking Summary - List of Pipes for Area Calculated

Left Side From	Left Side To	Length	Right Side From	Right Side To	Length
2	3	38.170	25	26	30.830
41	42	38.170	45	46	30.830
47	48	38.170	51	52	30.830
53	54	38.170	54	55	66.830

		Flow Required	Safety Margin	Pressure Differential
Left	12.000	573.651	39.501	-0.032
Area Calculated		573.712	39.469	0.000
Right	12.000	573.752	39.708	-0.239

Typical Distance Between Heads = 12.000

Split Point Used in Worst Area Peaked = 1

This report tells the user where the remote area is to be found in a **gridded system**. The **List of Pipes for Area Calculated** section reports where the remote area ended up after it was shifted automatically in the calculation. This is so the user can mark the remote area properly on their plan. The designations **Left Side** and **Right Side** are somewhat arbitrary, as they correspond to the L and R markers used in the setting up of the gridded calculation, not necessarily the physical orientation of the system 'on paper'.

In the report above, the distance between reference points 2 and 3 is listed at 38.170 (feet). In this example, 2 is the branch line connection at the cross main and 3 is the first flowing head in the remote area. The other side is 30.830 ft. The fourth line, right side, from 54 to 55 is 66.830 ft due to that line having less flowing heads operating.

The next section of this report shows the demands associated with the remote area. The **most** remote area is the one listed as **AREA CALCULATED**. This area is the one referenced in the List of Pipes for Area Calculated. The **Flow Required** and **Safety Margin** are reported for this location. The **LEFT** listing reports on the demands of the area if shifted one head left, at the distance seen (12.000). The one head **RIGHT** listing is also reported. These directions are consistent with the note above. If the remote area calculation had to 'move' the remote area more than one head in a given direction, you will see multiple LEFT entries, each one one head further along the grid line, until the pressure starts to drop, and the peak is found.

The Typical Distance Between Heads is reported. The Split Point Used in Area Calculated refers to the reference point name designated to the most remote head.