Water Calculation Worksheet for _____
Name / Address of Prohect

Information Required to Calculate Water Service Size

1. Demand of building in gallons per minute. WSFU's _____ = (GPM)_____
2. Difference in elevation from main or external pressure tank to building control valve. (feet)_____
3. Size of the water meter. (When applicable) 5/8" __, 3/4" __, 1" __, 1-1/2" __, 2" __, 3" __, 4" __, 6" __
4. Developed length from main or external pressure tank to building control valve. (feet) _____
5. Low pressure at main in street or external pressure tank. (psig)_____

Calculate Water Service Pressure Loss

6. Low pressure at main in street or external pressure tank. (value of # 5 above) _____
7. Water service diameter is _____. Material is _____. Pressure loss per 100 ft = _____ psi. X _____(decimal equivalent of service length, i.e.; 65ft = .65) _____

(Subtract line 7. from line 6.) **subtotal** _____

8. Determine pressure **gain or loss** due to elevation, (multiply the value of # 2 above by .434) value of "8" _____
9. Available pressure after the bldg. control valve. (Subtract or add line 8. Enter in "B".) **subtotal** _____

Calculate the Pressure Available for Uniform Loss (Value of "A")

B. Available pressure after the bldg. control valve. (from "9" above) Value of "B" _____

C. Pressure loss of water meter (when meter is required or installed) Value of "C" _____

(Subtract line C. from line B.) **subtotal** _____

D. Pressure at controlling fixture. Value of "D" _____
(Controlling fixture is _____)
(Subtract the value of D.) **subtotal** _____

E. Difference in elevation between the building control valve and the controlling fixture in feet _____ X .434 psi/ft. Value of "E" _____

(Subtract the value of E.) **subtotal** _____

F. Pressure loss due to water treatment devices, instantaneous water heaters and backflow preventers which serve the controlling fixture. Value of "F" _____
(Pressure loss due to _____)
(Subtract the value of F.) **subtotal** _____

G. Developed length from building control valve to controlling fixture in feet _____ X 1.5 Value of "G" _____

(Divide by the value of G.) **subtotal** _____
(Water distribution piping material is _____)
Multiply by 100

A. Pressure available for uniform loss **"A"** = _____

Multipurpose Piping Calculation Worksheet For _____

Area Which Is Being Served

Information Required to Calculate Water Service Diameter

1. Sprinkler demand 1sprinkler __, 2 sprinklers __, add 5 gpm for 2 family dwelling __ (GPM) _____
2. Difference in elevation from main or external pressure tank to building control valve. (feet) _____
3. Size of the water meter. (When applicable) 5/8" __, 3/4" __, 1" __, 1-1/2" __, 2" __, 3" __, 4" __, 6" __
4. Developed length from main or external pressure tank to building control valve. (feet) _____

Calculate Water Service Pressure Loss

5. Low pressure at main in street or external pressure tank. _____
6. Water service diameter is _____. Material is _____. Pressure loss per 100 ft = _____ psi. X _____(decimal equivalent of service length, i.e.; 65ft = .65) _____

   (Subtract line 6 from line 5.) **subtotal** _____
7. Determine pressure **gain or loss** due to elevation, (multiply the value of # 2 above by .434) value of "7" _____
8. Available pressure. . (Add or subtract the value of "7".) **subtotal** _____
9. Pressure loss of water meter (when meter is required or installed) value of "9" _____
10. Available pressure after the building control valve. (Subtract line 9 from line 8.) **subtotal** _____
11. Pressure loss through water softeners, filters and devices which serve this system……. _____
12. Available pressure before segment loss. (Subtract line 11 from line 10.) **subtotal** _____

	Sprinkler 1		Sprinkler 2		Segment 1		Segment 2		Segment 3		Segment 4	
Pipe size												
Material												
GPM												
Elevation												
	Qty.	Equiv.	Qty.	Equiv.	Qty.	Equiv.	Qty.	Equiv.	Qty.	Equiv.	Qty.	Equiv.
45 Ell												
90 Ell												
90 L. T. Ell												
Tee, branch												
Tee, run												
Coupling												
Adapter												
Gate vlv.												
Ball vlv.												
Pipe length	XXX		XXX		XXX		XXX		XXX		XXX	

(a) Total Equiv. Length _____ _____ _____ _____ _____ _____

(b) Loss Per Foot _____ _____ _____ _____ _____ _____

(c) Loss (a) x (b) _____ _____ _____ _____ _____ _____

(d) Elev. Loss _____ _____

(e) Sprinkler psig _____ _____

(f) Total (c + d + e) _____ _____

(g) Total loss from Segments 1 through 4 …… _____

(h) Pressure loss from the most demanding sprinkler segment. (Line (f), Sprinkler 1 or Sprinkler 2)…… _____

(i) Pressure required at the building control valve or after the device listed in line 11. (Line (g) + line (h))….. _____

(j) Pressure available from line 12. (Must be equal to or greater than line (i) above)…….…… _____

CPVC Tube ASTM F-442 SDR 13.5 (C= 150)

Flow rate (gpm)	3/4 inch Pressure loss/ft	1 inch Pressure loss/ft	1 1/4 inch Pressure loss/ft	1 1/2 inch Pressure loss/ft	2 inch Pressure loss/ft
10	**.058**	**.019**	**.006**	**.003**	**.001**
11	**.070**	**.023**	**.007**	**.004**	**.001**
12	**.082**	**.027**	**.008**	**.004**	**.001**
13	**.095**	**.031**	**.010**	**.005**	**.002**
14	**.109**	**.035**	**.011**	**.006**	**.002**
15	**.124**	**.040**	**.013**	**.006**	**.002**
16	**.139**	**.045**	**.014**	**.007**	**.002**
17	**.156**	**.051**	**.016**	**.008**	**.003**
18	**.173**	**.056**	**.018**	**.009**	**.003**
19	**.192**	**.062**	**.020**	**.010**	**.003**
20	**.211**	**.069**	**.022**	**.011**	**.004**
21	**.231**	**.075**	**.024**	**.012**	**.004**
22	**.251**	**.082**	**.026**	**.013**	**.004**
23	**.273**	**.089**	**.028**	**.014**	**.005**
24	**.295**	**.096**	**.030**	**.016**	**.005**
25	**.318**	**.104**	**.033**	**.017**	**.006**
26	**.342**	**.111**	**.035**	**.018**	**.006**
27	**.367**	**.119**	**.038**	**.019**	**.006**
28	**.393**	**.128**	**.041**	**.021**	**.007**
29	**.419**	**.136**	**.043**	**.022**	**.007**
30	**.446**	**.145**	**.046**	**.024**	**.008**
31	**.474**	**.154**	**.049**	**.025**	**.008**
32	**.503**	**.164**	**.052**	**.027**	**.009**
33	**.533**	**.173**	**.055**	**.028**	**.009**
34	**.563**	**.183**	**.058**	**.030**	**.010**
35	**.594**	**.193**	**.061**	**.032**	**.010**
36	**.626**	**.203**	**.065**	**.033**	**.011**
37	**.658**	**.214**	**.068**	**.035**	**.012**
38	**.692**	**.225**	**.071**	**.037**	**.012**
39	**.726**	**.236**	**.075**	**.039**	**.013**
40	**.761**	**.247**	**.078**	**.040**	**.013**

CPVC ASTM F-442
Equivalent length of Pipe in Fittings

	3/4	1	1 1/4	1 1/2	2
45 ell	**1**	**1**	**2**	**2**	**2**
90 ell	**7**	**7**	**8**	**9**	**11**
Coupling	**1**	**1**	**1**	**1**	**1**
Tee on branch	**3**	**5**	**6**	**8**	**10**
Tee on run	**1**	**1**	**1**	**1**	**1**

Equivalent length of Pipe in Valves

	3/4	1	1 1/4	1 1/2	2
Gate Valve	**0**	**0**	**0**	**0**	**1**
Full flow ball valve	**0**	**0**	**0**	**0**	**1**
Check Valve	**0**	**8**	**8**	**11**	**14**

Copper Tube Type M ASTM B88 (C = 150)

Flow rate (gpm)	3/4 inch Pressure loss/ft	1 inch Pressure loss/ft	1 1/4 inch Pressure loss/ft	1 1/2 inch Pressure loss/ft	2 inch Pressure loss/ft
10	**.084**	**.023**	**.009**	**.004**	**.001**
11	**.100**	**.028**	**.010**	**.005**	**.001**
12	**.118**	**.033**	**.012**	**.005**	**.001**
13	**.137**	**.038**	**.014**	**.006**	**.002**
14	**.157**	**.044**	**.016**	**.007**	**.002**
15	**.178**	**.049**	**.019**	**.008**	**.002**
16	**.201**	**.056**	**.021**	**.009**	**.002**
17	**.224**	**.062**	**.023**	**.010**	**.003**
18	**.249**	**.069**	**.026**	**.011**	**.003**
19	**.276**	**.077**	**.029**	**.013**	**.003**
20	**.303**	**.084**	**.032**	**.014**	**.004**
21	**.332**	**.092**	**.035**	**.015**	**.004**
22	**.362**	**.101**	**.038**	**.017**	**.004**
23	**.393**	**.109**	**.041**	**.018**	**.005**
24	**.425**	**.118**	**.044**	**.020**	**.005**
25	**.458**	**.127**	**.048**	**.021**	**.006**
26	**.493**	**.137**	**.051**	**.023**	**.006**
27	**.529**	**.147**	**.055**	**.024**	**.006**
28	**.565**	**.157**	**.059**	**.026**	**.007**
29	**.603**	**.168**	**.063**	**.028**	**.007**
30	**.642**	**.179**	**.067**	**.030**	**.008**
31	**.683**	**.190**	**.071**	**.031**	**.008**
32	**.724**	**.201**	**.075**	**.033**	**.009**
33	**.766**	**.213**	**.080**	**.035**	**.009**
34	**.810**	**.225**	**.084**	**.037**	**.010**
35	**.855**	**.238**	**.089**	**.039**	**.010**
36	**.900**	**.250**	**.094**	**.041**	**.011**
37	**.947**	**.263**	**.099**	**.044**	**.011**
38	**.995**	**.277**	**.104**	**.046**	**.011**
39	**1.044**	**.290**	**.109**	**.048**	**.013**
40	**1.094**	**.304**	**.114**	**.050**	**.013**

Copper Type M ASTM B88
Equivalent length of Pipe in Fittings

	3/4	1	1 1/4	1 1/2	2
45 ell	**0**	**2**	**1**	**2**	**3**
90 ell	**2**	**3**	**3**	**5**	**7**
90 L. T. ell	**0**	**3**	**2**	**2**	**4**
Tee on branch	**4**	**8**	**7**	**9**	**13**
Tee on run	**1**	**3**	**2**	**3**	**5**

Water Calculation Worksheet Instructions

The front cover of this pamphlet is a standard water calculation worksheet. The multipurpose piping system must be sized for the water distribution and multipurpose piping system. Use the front cover to do the water sizing as you would for any system without sprinklers. Next do the calculations for the multipurpose system with the pages that follow. The multipurpose piping must be sized to meet the requirements of both systems.

Sprinkler Calculation Worksheet Instructions

Fill in the Segment Loss Table

There are 6 columns provided for calculating the loss from friction through the length of piping. Generally a segment is defined as the equivalent length of pipe of a given size. The first two segments are intended to be used for the sprinklers in a multiple sprinkler compartment. Only one column is required when sizing for a single sprinkler compartment.

Fill in the top 4 rows of the sprinkler columns first. The pipe size, material, gpm (flow rate) through the segment and elevation from the control valve to the sprinkler.

The column headed "Qty." is provided for the number of each of the fittings in the rows. The column headed "Equiv." is the equivalent feet of the fittings multiplied by the quantity of the fittings, i.e. 6 - 1 ¼ copper 90 degree ell's @ 3 equivalent feet for each equals 18 equivalent feet in the 90 Ell row.

The last row (pipe length) is for entering the actual length of pipe (in feet) in the segment.

If the worksheet is being filled in for a multiple sprinkler compartment and you are not sure which sprinkler in the compartment is the most demanding, complete both sprinkler columns including all fittings and pipe for each sprinkler back to the point where they are both served by one common tee. Include that tee in the column. If the pipe diameter increases before the common tee, use one or more of the Segment columns to include the piping. The most demanding sprinkler in the compartment must be used in the calculation.

Line (a) Add the "Equiv." column from "45 Ell" down through "Pipe length".
Line (b) Go to the appropriate table on the opposite page; find the pipe size and gpm in that segment. The number in the intersecting row and column is the loss per foot. I.e. 26 gpm through a 1 ¼ " Copper tube type M equals a .051 pressure loss per foot.
Line (c) Multiply (a) the Total Equivalent Length by (b) pressure loss per foot. Enter the total in each of the columns.
Line (d) Enter the elevation loss from the building control valve to the sprinkler (height x .434). (Sprinkler columns only).
Line (e) Each sprinkler has a pressure required to supply the gpm for the coverage area. This is part of the listing. i.e. For a coverage area of 12ft x 12ft a single sprinkler may require a minimum flow of 12 gpm and residual pressure of 11.8. Enter the pressure of 11.8.
Line (f) Add rows (c), (d) and (e). This is the loss from the sprinkler or sprinklers. Compare the two sprinkler columns and any additional Segments for the sprinkler. The sprinkler with the greatest loss is the most demanding.

Once you have determined the most demanding sprinkler, the combined gpm from the two sprinklers can be used to determine the loss from the water service, water meter and piping upstream. Continue by filling in the Segment columns that include the balance of the piping back to the building control valve or an appliance or device that creates an additional pressure loss.

Line (g) Add the loss from each Segment from line (c). Include only the Segments.
Line (h) Enter pressure required by the most demanding sprinkler. From line (f), Sprinkler 1 or Sprinkler 2.
Line (i) Add line (g) and line (h). The result is the pressure required at the building control valve or after an appliance or other device that creates an additional pressure loss.

Calculate Water Service Pressure Loss

Line 1. Place an "X" to indicate the number of design sprinklers, 1 sprinkler or 2 sprinklers. Also place an "X" if the project is a 2 family dwelling. Write in the gpm demand from the design sprinklers (maximum of 2) and any additional as a result of serving a 2 family dwelling. It will be used for determining the pressure loss through the water service and water meter.

Line 5. Determine the low pressure at the main or an external pressure tank. You may need to contact the water purveyor for this information. If the system is being served by a well with an internal pressure tank, enter the low pressure at the internal pressure tank in line 8.

Continue to fill in lines 6 through line 12.

Line (j) Enter the remaining pressure from line 12.