Andersen Construction Company
6712 N. Cutter Circle PO Box 6712
Portland OR 97217
US

TRANSMITTAL

No. 11-0866-0048

PROJECT: Wallowa Memorial Hospital MOB
TO: Clark/Kjos Architects*

DATE: 11/14/2011
RE: 301-211300-Calculation Resubmittal - Fire Sprinkler Systems

ATTN: Matt Kadyk
JOB: 11-0866

WE ARE SENDING:	SUBMITTED FOR:	ACTION TAKEN:
☐ Shop Drawings	☑ Approval	☐ Approved as Submitted
☐ Letter	☐ Your Use	☐ Approved as Noted
☐ Prints	☐ As Requested	☐ Returned After Loan
☐ Change Order	☐ Review and Comment	☐ Resubmit
☐ Plans		☐ Submit
☐ Samples	SENT VIA:	☐ Returned
☐ Specifications	☑ Attached ☐ Separate Cover	☐ Returned for Corrections
☑ Other: Calculations		☐ Due Date:
		☐ Other:

Line	Item	Package	Code	Rev.	Qty	Date	Description	Status
1	Submittal	301-211300	301-211300-001			11/14/2011	Calculations Resubmittal - Fire Sprinkler Systems	

☐ No Exception Taken ☒ Make Corrections Noted
☐ Revise & Resubmit ☐ Rejected
Reviewed for general conformity with the contract documents. Subcontractor is responsible for all quantities, dimensions, joinery, and complete compliance with contract documents.
ANDERSEN CONSTRUCTION CO., INC.
By KA Date 11/14/11
Job # 11-0866
Submittal # 301-211300-001
*Please reference attached response to original review comments.

REMARKS: Matt,

Please find the attached fire sprinkler systems calculation resubmittal for review and approval.

Thanks,

Kris Anderson
Andersen Const. Co.

CC:

Signed:
Kris Anderson

INTUITIVE FIRE

11/2/11

Kris Anderson
Anderson Const. Co

Re: Wallowa Memorial Hospital MOB.
Enterprise Or.

Mr. Anderson

I have addressed and reviewed the Drawings/Documents. Comments/revisions have been recorded on the resubmitted documents and below.

Comments from ~~Anderson Construction:~~ ▶ CK Architects

1) *Walkway not in Project.*
   Sprinkler drawings have been modified. ✓
2) Conceal Sprinkler lines in lobby WITHIN the roof ceiling and ABOVE lines at canopy.
   Sprinkler piping has been installed as shown on the architect drawings for the area.

Comments from Interface Engineering
Drawings:

1) *Drawings Submitted are not signed and sealed by Professional Engineer.*
   Drawing/Calcs have been reviewed and signed. ✓

2) Provide method for forward flow testing backflow.
   Testing of backflow is provided through a 2.5" drain line. See riser diagram. ✓

3) Sheet FP-2 & FP-3: No sprinkler protection has been provided at combustible construction Exits at gridline 1 between gridlines C&D and between gridlines D&E. Please provide.
   Dry Pendants Sprinklers have been added in three locations. ✓

4) Sheet FP-4: Dry system routing at Lobby 002 and Vestibule 001 does not coincide with dry system routing shown on sheet P2.11. Verify acceptability of routing with architect.
   Routing of fire main has been modified for coordination and installation over corridor. Spec section 21.1.04.c only calls out coordination with the architect for area containing exposed piping. ✓

5) No method of lateral and vertical branch line restraints (including, but not limited to end of branch line restraints) has been provided per NFPA 13-2007 section 9.3.6 and 9.3.6.3 and Table 9.3.6.4. Please provide.
   Branchline restraint notes have been added to drawings. ✓

6) Longitudinal & lateral sway bracing locations for the wet sprinkler system as required by are not shown on drawings. Please provide per sway brace calculations.
Sway bracing calcs, details and notes have been added to drawings. ✓

7) Grid system is not provided with pressure relief valve per NFPA13. Please provide.
Notes have been added to riser. ✓

8) Sprinklers have not been provided under combustible stairs. Please provide.
Sprinklers have been added to drawings. ✓

9) No bell is shown. Please provide.
Notes for bell have been added to riser. ✓

10) Sheet FP-1 does not show dry pipe valve trim, including gauges. Please provide full trim.
Detail has been added to riser. ✓

11) No air compressor is shown
Detail and material cut sheets have been added to package. ✓

12) No spare sprinkler box is shown. Please provide.
Detail has been added to riser. ✓

13) Fire department connection is not shown to have a ball drip valve for drainage. Please provide, with drain to sewer or daylight.
Ball drip is show on check valve. ✓

14) Length of ½" thru bolt fastening longitudinal and lateral sway bracing is not provided. Please provide. Identify structural members on drawings showing that the member to which the fastener will be attached is thick enough to hold the entire required length of the thru bolt identified in sway brace calculations.
See Sway Brace Calculations. ✓

15) Hanger detail #1 shows a 2" and a 2.5" Sammy Sidewinder in a 2x6 truss member. A 2x6 truss is actually 1.625" wide. The 2" and 2.5" Sidewinder will just have the excess length extending out the back which will not provide the intended support. Please utilize a hanger that will fit within the structural member it is attached to.
SWG 10 will be utilized. See Hanger #8. ✓

16) Sheet FP-4, the last standard coverage sprinkler at the right-hand end of the canopy is more than 7'6" from the end of the canopy. This area does not meet the criteria of being a "small room" as described in NFPA 13-2007 3.3.15 and so no standard coverage sprinkler may exceed half the allowable distance between sprinklers. Please revise.
The walkway is deleted from the fire sprinkler project scope. ✓

See comments under Hydraulic Calculations, below. If revised calculations require changes in pipe sizes, please provide the

Hydraulic Calculations:

1) Hydraulic calcs are not signed and sealed by registered Professional Engineer per specification 210000.1.04.L.2.b and Oregon state law. Please provide.
   Reviewed and signed. ✓

2) Roof pitch exceeds 2 in 12. Design areas are not increased for dry systems and sloped roofs per NFPA 13. Please revise.
   Hydraulic calcs utilize 7 sprinklers included with 2 sprinklers on eve. (See Attic Sprinkler cut sheets for direction on remote area. ✓

3) Canopy calculation provides a minimum of 7 psi at 14.8 gpm. These sprinklers cover 191 sq. ft. each (assuming 13'10" apart x 13'10" wide). Using the area density method each sprinkler needs to provide 0.10 gpm per sq. ft. 191 sq. ft. x 0.10 = 19.1 gpm per sprinkler per NPFA 13-2007 section 22.4.4.5.3. The commentary in the Automatic Sprinkler Systems Handbook is helpful in understanding this concept. Please revise calculations to provide a full 0.10 gpm per sq. ft. of sprinkler coverage.
   Sprinklers have been added/relocated and recalculated. ✓

4) Lower Wet calculation provides a minimum of 7 psi at 14.82 gpm at node 101 and 7.426 psi at15.26 gpm at node 103. Node 103 is 12' to the next sprinkler and 6'10" from the wall and thus protects 163.92 sq. ft. Using the area density method each sprinkler needs to provide 0.10 gpm per sq. ft. 163.92 sq. ft. x 0.10 = 16.39 gpm per sprinkler per NPFA 13-2007 section 22.4.4.5.3. Please revise calculations to provide a full 0.10 gpm per sq. ft. of sprinkler coverage.
   Sprinklers have been added/respaced and recalculated. ✓

Sway Brace Calculations:

1) No sway brace calculations have been provided. When provided they will be evaluated per the following items, which will contain dispositions at that time. Please provide.
   Provided. ✓
2) Sway brace calcs are/are not signed and sealed by registered Professional Engineer per specification 210000.1.04.L.2.b
   Created, reviewed and signed. ✓

3) Building Code chapter 16 calcs determining force factor used in NFPA 13 calcs are/are not provided per specification 210000.
   Calcs Provided. ✓

4) Sway brace calcs do/do not appear to conform to NFPA 13.
   Calcs Provided. ✓

5) Lateral sway brace calcs do/do not include branch lines.
   Calcs Provided. ✓
6) Pipe type included in calculations matches/ does not match pipes shown on plans.
   Calcs Provided. ✓
7) Bracing details shown on plans do/do not match components and configuration used in calculations.
   Calcs Provided. ✓

Materials:

8) ARGCO – Fire Department Connections (Groove Outlet): No Exception Taken for 2-way straight pattern single clapper model. Two-way 90 degree pattern single clapper REJECTED because it is not UL Listed or FM Approved.

FPPI- FDC. UL/FM Approved

Reference:

1) a. Tyco Attic, K5.6 and K8.0, model BB1, brass, 200 degree, TY4180 and TY3180. No cut sheet provided. Please provide.

See submittal

b. Tyco Attic, K5.6, model SD1, brass, 200 degree, TY3183. No cut sheet provided. Please provide.

See submittal

c. Tyco Concealed, K5.6, TY3531, model RFII, unknown response, white finish, 155 degree. No cut sheet provided. Please provide.

See submittal

d. Tyco Extended Coverage Pendent, white, model DS-ECC, 155 degree, K5.6, TY3539. No cut sheet provided. Please provide.

See submittal

2) Pipe:
   a. Underground: No cut sheet provided. Please provide.

Underground installed under separate contract. (No Materials Included in this submittal)

3) Fittings:
   a. Grooved: No cut sheet provided. Please provide.

See submittal

   b. Threaded: No cut sheet provided. Please provide.

CI Fittings added , See submittal

   c. Flanged: No cut sheet provided. Please provide.

See submittal

4) Couplings:
   a. Rigid: No cut sheet provided. Please provide.

See submittal

   b. Flexible: No cut sheet provided. Please provide.

See submittal

5) Valves:
   a. Automatic Ball Drip: No cut sheet provided. Please provide.

See submittal

   b. Pressure Relief: No cut sheet provided. Please provide.

See Submittal-Riser Manifold mod. CR option #6

6) Hangers: No cut sheet provided. Please provide.
   Hangers in Submittal
7) Fasteners for Hangers: No cut sheet provided. Please provide.
   Sammy Hangers Provided
8) Sway Brace Fittings: No cut sheet provided. Please provide.
   See submittal
9) Sway Brace Fasteners: No cut sheet provided. Please provide.
   See submittal and details.
10) Bells: No cut sheet provided. Please provide.
    See submittal and details.
11) Connections:
    a. Inspector's Test Connection: No cut sheet provided. Please provide.
       See submittal- Riser Manifold mod. CR
12) Dry Systems:
    a. Air Compressor: No cut sheet provided. Please provide.
       See submittal-General Air
    b. Accelerator: No cut sheet provided. Please provide.
       Accelerator not required.
    c. Air Pressure Maintenance Device: No cut sheet provided. Please provide.
       See submittal-General Air (231.45 Gallon Air Capacity)

Please feel free to contact me with any questions regarding this letter.

Professional Regards,

Franklin Callfas, P.E.
Fire Protection Engineer
Intuitive Engineering Services
541-848-1798

Wallowa
Project Table of Contents
November 2, 2011
Rev-0a

Drawings

FP1	Cover Sheet	1
FP2	RCP Layout	2
FP3	Wet Piping	3
FP4	Dry Piping	4
FP5	Isometric View	5

Materials

Allied Pipe (Sch. 10, 40)	1
Ames-C200 4" Backflow	2
Nibco. Butterfly Valve Mod. GD-4765-4N	3
Nibco. Check Valve Mod. KG-900-W	4
Reliable-4" (Mod. CR) Riser Manifold (W/Press Relief)	5
Tyco Dry Pipe Valve-(GxG-DPV-1)	6
Tyco Sprinklers	7
FPPI-4x2.5x2.5 FDC	8
Ball Drip	9
General Air Compressor (Mod OL33550ACT) With AMD-1 air Maint device	10
Fittings	
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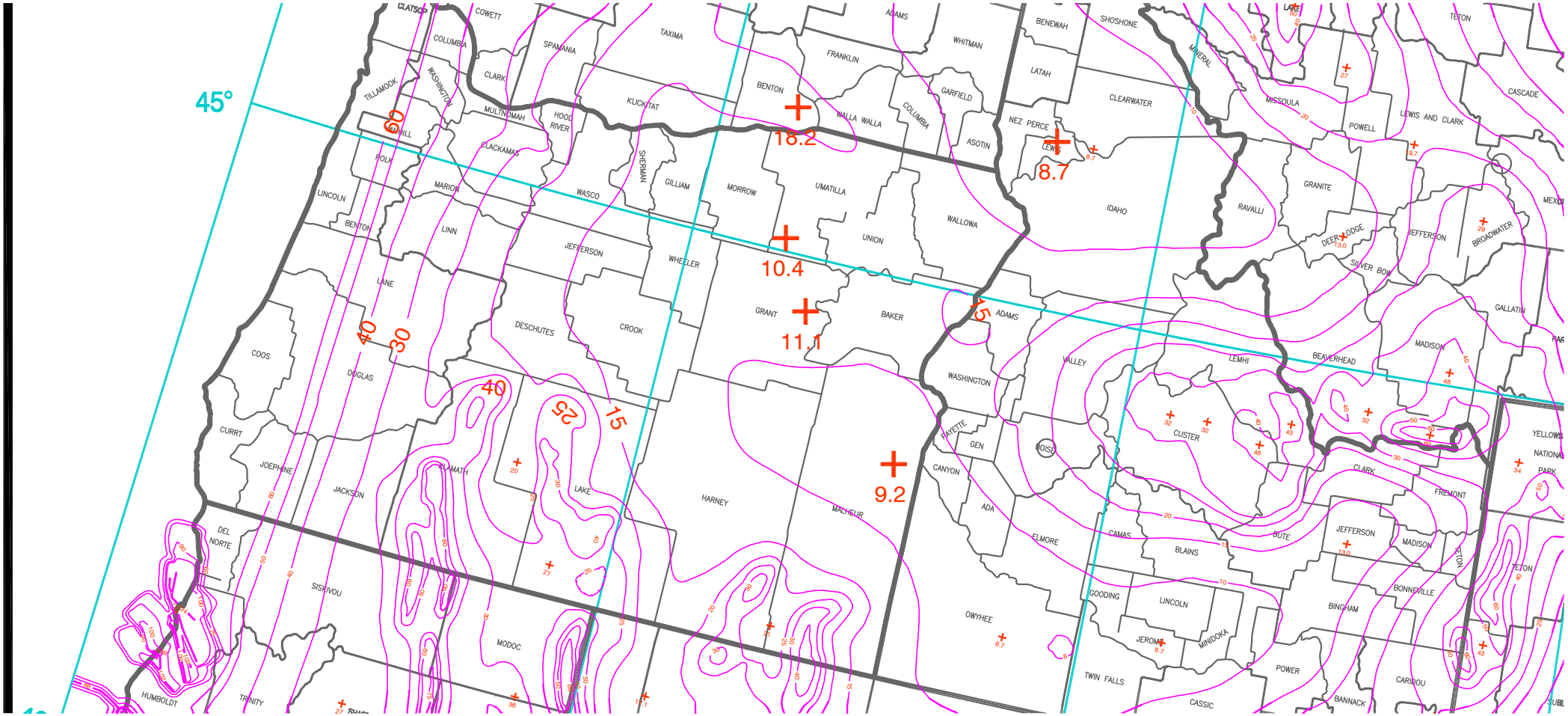
Spare Head Box	13
120VAC Bell	14
Tolco-EQ Attachments	15
Tolco-fig. 200 Hanger	16
Sammy Hangers	17

Calculations

Lower Wet	1
Attic-Dry	2
Extended Coverage-Entry	3
Lateral Sway Bracing	4
Longitudinal Sway Bracing	5


45°
18.2
8.7
10.4
11.1
9.2
60
40
30
25
15
CLATSOP
COWETT
COLUMBIA
SPAMANIA
TAXIMA
ADAMS
WHITMAN
BENEWAH
SHOSHONE
TETON
TILLAMOOK
WASHINGTON
CLARK
MULTNOMAH
HOOD RIVER
KLICKITAT
BENTON
FRANKLIN
WALLA WALLA
COLUMBIA
GARFIELD
LATAH
CLEARWATER
MISSOULA
POWELL
LEWIS AND CLARK
CASCADE
POLK
CLACKAMAS
SHERMAN
GILLIAM
MORROW
UMATILLA
ASOTIN
NEZ PERCE
IDAHO
RAVALLI
GRANITE
LINCOLN
MARION
WASCO
UNION
WALLOWA
DEER LODGE
SILVER BOW
JEFFERSON
BROADWATER
LINN
JEFFERSON
WHEELER
LANE
GRANT
BAKER
ADAMS
GALLATIN
DESCHUTES
CROOK
COOS
DOUGLAS
VALLEY
LEMHI
BEAVERHEAD
MADISON
WASHINGTON
CUSTER
CURRT
JOEPHINE
JACKSON
KLAMATH
LAKE
HARNEY
MACHEUR
FAYETTE
GEM
BOISE
CANYON
ADA
ELMORE
CAMAS
BLAINS
BUTE
CLARK
FREMONT
YELLOWS
NATIONAL
PARK
DEL NORTE
SISKIYOU
MODOC
OWYHEE
GOODING
LINCOLN
JEROME
MINIDOKA
TWIN FALLS
CASSIC
POWER
BANNACK
BINGHAM
BONNEVILLE
CARIBOU
HUMBOLDT
TRINITY

Hydraulic Overview

Job Number: 11-137
Report Description: Light Hazard (Lower Wet Calcs)

Job

Job Number 11-137	Design Engineer Franklin Callfas
Job Name: Wallowa Medical Hospital	Phone (541) 848-1798 / FAX
Address 1 Wallowa County Health Care District	State Certification/License Number
Address 2 Enterprise, Oregon, 97828	AHJ
Address 3	Job Site/Building

System

Density 0.100gpm/ft²	Area of Application 1500.00ft² (Actual 927.97ft²)
Most Demanding Sprinkler Data 5.6 K-Factor 14.82 at 7.000	Hose Streams 100.00
Coverage Per Sprinkler 100.00ft²	Number Of Sprinklers Calculated 12
System Pressure Demand 51.433	System Flow Demand 194.16
Total Demand 294.16 @ 51.433	Pressure Result +27.083 (34.5%)

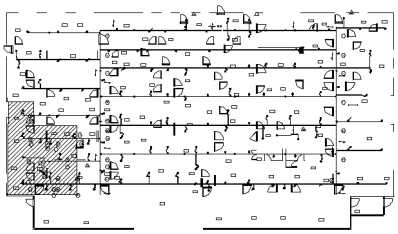
Supplies

Node	Flow(gpm)	Hose Flow(gpm)	Static(psi)	Residual(psi)
2	1200.00	100.00	80.000	60.000

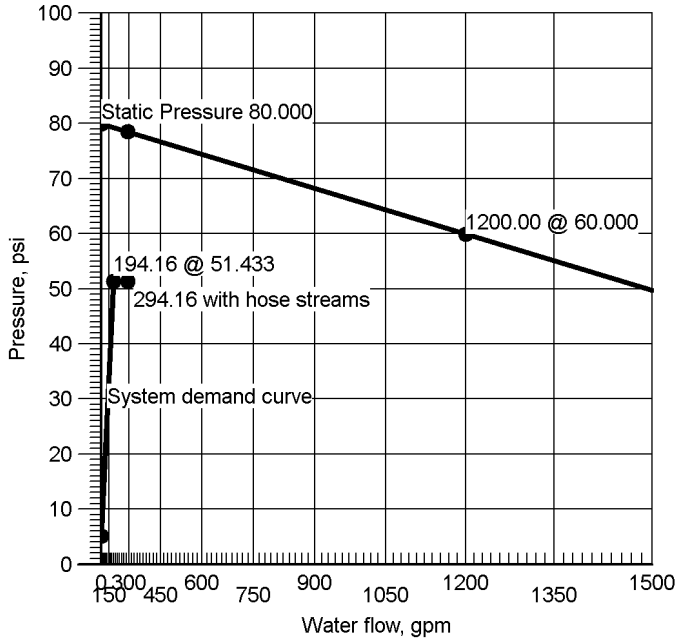
Check Point Gauges

Identifier	Pressure(psi)	K-Factor(K)	Flow(gpm)

Wallowa Rev-0a



Supply at Node 2 (1200.00, 100.00, 80.000, 60.000)



Hydraulic Summary

Job

Job Number: 11-137	Design Engineer: Franklin Callfas
Job Name: Wallowa Medical Hospital	State Certification/License Number:
Address 1: Wallowa County Health Care District	AHJ:
Address 2: Enterprise, Oregon, 97828	Job Site/Building:
Address 3:	Drawing Name: Wallowa Rev-0a

System

Most Demanding Sprinkler Data: 5.6 K-Factor 14.82 at 7.000

Hose Allowance At Source: 100.00

Additional Hose Supplies

Node	Flow(gpm)

Total Hose Streams: 100.00

System Flow Demand	Total Water Required (Including Hose Allowance)
194.16	294.16

Maximum Pressure Unbalance In Loops: 0.000

Maximum Velocity Above Ground: 14.20 between nodes 45 and 47

Maximum Velocity Under Ground: 4.45 between nodes 2 and 5

Volume capacity of Wet Pipes	Volume capacity of Dry Pipes
89.79gal	388.01gal

Remote Area(s)

Occupancy	Job Suffix
Light Hazard (Lower Wet Calcs)	
Density	**Area of Application**
0.100gpm/ft²	1500.00ft² (Actual 927.97ft²)
Number Of Sprinklers Calculated	**Coverage Per Sprinkler**
12	100.00ft²

AutoPeak Results: Pressure For Remote Area(s) Adjacent To Most Remote Area

Supplies

Node	Hose Flow (gpm)	Static (psi)	Residual (psi)	@	Flow (gpm)	Available (psi)	@	Total Demand (gpm)	Required (psi)	Safety Margin (psi)
2	100.00	80.000	60.000		1200.00	78.516		294.16	51.433	27.083

Contractor

	Contractor Number	Contact Name	Contact Title
Name of Contractor:		Phone	Extension
Address 1		FAX	
Address 2		E-mail	
Address 3		Web-Site	

Summary Of Outflowing Devices

Job Number: 11-137
Report Description: Light Hazard (Lower Wet Calcs)

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)		
Sprinkler	**101**	**14.82**	**10.00**	**5.6**	**7.000**		
Sprinkler	102	15.01	10.00	5.6	7.186		
Sprinkler	103	15.04	10.00	5.6	7.216		
Sprinkler	104	15.18	10.00	5.6	7.353		
Sprinkler	105	15.32	10.00	5.6	7.488		
Sprinkler	106	15.52	10.00	5.6	7.685		
Sprinkler	107	15.65	10.00	5.6	7.806		
Sprinkler	108	16.36	10.00	5.6	8.531		
Sprinkler	109	16.43	10.00	5.6	8.605		
Sprinkler	110	17.12	10.00	5.6	9.344		
Sprinkler	111	17.15	10.00	5.6	9.384		
Sprinkler	112	20.56	10.00	5.6	13.477		

Most Demanding Sprinkler Data

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)	
2	-3'-0	S	51.433	194.16	
101	9'-0	Spr(-7.000), fd(41'-0)	7.000	14.82	
102	9'-0	Spr(-7.186), fd(41'-0)	7.186	15.01	
103	9'-0	Spr(-7.216), fd(41'-0)	7.216	15.04	
104	9'-0	Spr(-7.353), fd(41'-0)	7.353	15.18	
105	9'-0	Spr(-7.488), fd(41'-0)	7.488	15.32	
106	9'-0	Spr(-7.685), fd(29'-2¾)	7.685	15.52	
107	9'-0	Spr(-7.806), fd(41'-0)	7.806	15.65	
108	9'-0	Spr(-8.531), fd(41'-0)	8.531	16.36	
109	9'-0	Spr(-8.605), fd(41'-0)	8.605	16.43	
110	9'-0	Spr(-9.344), fd(41'-0)	9.344	17.12	
111	9'-0	Spr(-9.384), fd(41'-0)	9.384	17.15	
112	9'-0	Spr(-13.477), fd(41'-0)	13.477	20.56	
1	-0'-10¼		0.000		
4	-0'-6		0.000		
5	0'-0		49.346		
7	-0'-6		0.000		
19	3'-8½	T(10'-0)	42.205		
32	3'-1	BFP(-5.000)	47.972		
44	5'-6½		41.492		
45	5'-8		41.438		
47	5'-11¼		40.150		
52	10'-0	LtE(2'-10¼)	37.857		
56	5'-0	T(26'-4)	41.879		
59	6'-6¾	PO(10'-0)	39.827		
67	4'-5½		42.096		
72	10'-0	E(4'-4¾)	27.755		
90	10'-0	T(7'-0¾)	31.853		
91	10'-0	T(7'-1½)	36.995		
113	10'-0	PO(4'-3¼)	26.136		
126	10'-0	PO(4'-3¼)	27.948		
155	10'-0	PO(4'-3¼)	24.975		
172	10'-0	PO(4'-3¼)	26.479		
240	10'-0	PO(4'-3¼)	22.816		
257	10'-0	PO(4'-3¼)	24.713		
289	10'-0	PO(5'-0)	19.341		
295	10'-0	PO(4'-3¼)	21.161		
315	10'-0	PO(4'-3¼)	20.508		
335	10'-0	PO(4'-3¼)	23.515		
362	10'-0	PO(5'-0)	10.513		
363	10'-0	PO(5'-0)	10.710		
365	10'-0	PO(5'-0)	11.172		
366	10'-0	PO(5'-0)	13.397		
369	10'-0	PO(4'-3¼)	19.438		
408	10'-0	PO(4'-3¼)	19.025		
426	10'-0	PO(4'-3¼)	22.895		
442	10'-0	PO(5'-0)	13.454		
446	10'-0	PO(4'-3¼)	18.748		
485	10'-0	PO(5'-0)	10.001		
486	10'-0	PO(5'-0)	10.271		
488	10'-0	PO(5'-0)	12.221		
491	10'-0	PO(4'-3¼)	18.531		
511	10'-0	PO(4'-3¼)	22.709		
526	10'-0	T(5'-0)	12.690		
531	12'-10½	PO(6'-0)	38.730		
532	12'-10¾	PO(6'-0)	38.715		
534	12'-11¼	PO(6'-0)	38.699		
536	12'-11¾	PO(6'-0)	38.683		
539	13'-0¼	PO(6'-0)	38.666		
542	12'-11½	PO(6'-0)	38.694		
544	12'-11	PO(6'-0)	38.709		
546	12'-10½	PO(6'-0)	38.724		

Node Analysis

Job Number: 11-137
Report Description: Light Hazard (Lower Wet Calcs)

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)	
582	10'-0	PO(5'-0)	10.437		

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary	
• • • • • Route 1 • • • • •									
DY	1.0490	14.82	5.50	120		0.074703	0'-0	Pf	3.436
101	9'-0	14.82	5.6	7.000		Sprinkler,	46'-0	Pe	-0.436
485	10'-0			10.001		PO(5'-0), fd(41'-0)	46'-0	Pv	
BL	1.3800	14.82	3.18	100		0.027529	9'-9¾	Pf	0.270
485	10'-0			10.001				Pe	
486	10'-0			10.271			9'-9¾	Pv	
BL	1.3800	29.83	6.40	100		0.100455	1'-7¾	Pf	0.166
486	10'-0	15.01		10.271		Flow (q) from Route 2		Pe	
582	10'-0			10.437			1'-7¾	Pv	
BL	1.3800	44.87	9.62	100		0.213829	8'-4¼	Pf	1.785
582	10'-0	15.04		10.437		Flow (q) from Route 3		Pe	
488	10'-0			12.221			8'-4¼	Pv	
BL	1.3800	61.23	13.13	100		0.379994	12'-4	Pf	6.310
488	10'-0	16.36		12.221		Flow (q) from Route 8	4'-3¼	Pe	
491	10'-0			18.531		PO(4'-3¼)	16'-7¼	Pv	
FR	2.1570	43.33	3.80	100		0.022771	9'-6	Pf	0.216
491	10'-0			18.531				Pe	
446	10'-0			18.748			9'-6	Pv	
FR	2.1570	92.44	8.12	100		0.092492	3'-0	Pf	0.277
446	10'-0	49.11		18.748		Flow (q) from Route 6		Pe	
408	10'-0			19.025			3'-0	Pv	
FR	2.1570	75.27	6.61	100		0.063241	6'-6¼	Pf	0.413
408	10'-0			19.025				Pe	
369	10'-0			19.438			6'-6¼	Pv	
FR	2.1570	138.54	12.16	100		0.195524	5'-5¾	Pf	1.070
369	10'-0	63.27		19.438		Flow (q) from Route 4		Pe	
315	10'-0			20.508			5'-5¾	Pv	
FR	2.1570	123.56	10.85	100		0.158211	4'-1½	Pf	0.654
315	10'-0			20.508				Pe	
295	10'-0			21.161			4'-1½	Pv	
FR	2.1570	144.11	12.65	100		0.210329	7'-10½	Pf	1.655
295	10'-0	20.56		21.161		Flow (q) from Route 12		Pe	
240	10'-0			22.816			7'-10½	Pv	
FR	2.1570	132.44	11.63	100		0.179885	12'-0	Pf	2.159
240	10'-0			22.816				Pe	
155	10'-0			24.975			12'-0	Pv	
FR	2.1570	122.13	10.72	100		0.154854	7'-6	Pf	1.161
155	10'-0			24.975				Pe	
113	10'-0			26.136			7'-6	Pv	
FR	2.1570	110.74	9.72	100		0.129198	8'-1¾	Pf	1.619
113	10'-0			26.136			4'-4¾	Pe	
72	10'-0			27.755		E(4'-4¾)	12'-6½	Pv	
BL	2.0670	110.74	10.59	100		0.159000	50'-11¾	Pf	9.239
72	10'-0			27.755			7'-1½	Pe	
91	10'-0			36.995		T(7'-1½)	58'-1¼	Pv	
BL	2.4690	194.16	13.01	100		0.189093	1'-8½	Pf	0.862
91	10'-0	83.42		36.995		Flow (q) from Route 16	2'-10¼	Pe	
52	10'-0			37.857		LtE(2'-10¼)	4'-6¾	Pv	
FR	2.6350	194.16	11.42	100		0.137737	3'-5¼	Pf	0.475
52	10'-0			37.857				Pe	1.495
59	6'-6¾			39.827			3'-5¼	Pv	
FR	2.6350	148.56	8.74	100		0.083933	0'-7½	Pf	0.052
59	6'-6¾			39.827				Pe	0.271
47	5'-11¼			40.150			0'-7½	Pv	
DY	2.0670	148.56	14.20	120		0.195408	0'-0	Pf	1.172
47	5'-11¼			40.150			6'-0	Pe	0.115
45	5'-8			41.438		BV(6'-0)	6'-0	Pv	
DY	2.4690	148.56	9.95	120		0.082238	0'-0	Pf	0.000
45	5'-8			41.438				Pe	0.054
44	5'-6½			41.492			0'-0	Pv	
DY	4.2600	148.56	3.34	120		0.005773	0'-0	Pf	0.152
44	5'-6½			41.492			26'-4	Pe	0.235
56	5'-0			41.879		T(26'-4)	26'-4	Pv	
FR	4.2600	194.16	4.37	120		0.009474	1'-4	Pf	5.262
56	5'-0	45.61		41.879		Flow (q) from Route 13	26'-4	Pe	0.831
32	3'-1			47.972		T(26'-4), BFP(-5.000)	27'-8	Pv	
FR	4.2600	194.16	4.37	100		0.013275	3'-1	Pf	0.041
32	3'-1			47.972				Pe	1.333
5	0'-0			49.346			3'-1	Pv	
UG	4.2200	194.16	4.45	140		0.007458	88'-3	Pf	0.783
5	0'-0			49.346		Supply,	16'-8¾	Pe	1.304
2	-3'-0			51.433		E(16'-8¾), S	104'-11¾	Pv	

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary	
		100.00				Hose Allowance At Source			
2		294.16							
• • • • • Route 2 • • • • •									
DY	1.0490	15.01	5.57	120		0.076535	0'-0	Pf	3.521
102	9'-0	15.01	5.6	7.186		Sprinkler,	46'-0	Pe	-0.436
486	10'-0			10.271		PO(5'-0), fd(41'-0)	46'-0	Pv	
• • • • • Route 3 • • • • •									
BL	1.0490	15.04	5.58	120		0.076837	1'-7	Pf	3.656
103	9'-0	15.04	5.6	7.216		Sprinkler,	46'-0	Pe	-0.436
582	10'-0			10.437		PO(5'-0), fd(41'-0)	47'-7	Pv	
• • • • • Route 4 • • • • •									
DY	1.0490	15.18	5.64	120		0.078180	0'-0	Pf	3.596
104	9'-0	15.18	5.6	7.353		Sprinkler,	46'-0	Pe	-0.436
362	10'-0			10.513		PO(5'-0), fd(41'-0)	46'-0	Pv	
BL	1.3800	15.18	3.26	100		0.028810	6'-10	Pf	0.197
362	10'-0			10.513				Pe	
363	10'-0			10.710			6'-10	Pv	
BL	1.3800	30.51	6.54	100		0.104744	4'-5	Pf	0.462
363	10'-0	15.32		10.710		Flow (q) from Route 5		Pe	
365	10'-0			11.172			4'-5	Pv	
BL	1.3800	46.16	9.90	100		0.225293	9'-10½	Pf	2.225
365	10'-0	15.65		11.172		Flow (q) from Route 7		Pe	
366	10'-0			13.397			9'-10½	Pv	
BL	1.3800	63.27	13.57	100		0.403822	10'-8¼	Pf	6.041
366	10'-0	17.12		13.397		Flow (q) from Route 10	4'-3¼	Pe	
369	10'-0			19.438		PO(4'-3¼)	14'-11½	Pv	
• • • • • Route 5 • • • • •									
DY	1.0490	15.32	5.69	120		0.079513	0'-0	Pf	3.658
105	9'-0	15.32	5.6	7.488		Sprinkler,	46'-0	Pe	-0.436
363	10'-0			10.710		PO(5'-0), fd(41'-0)	46'-0	Pv	
• • • • • Route 6 • • • • •									
BL	1.0490	15.52	5.76	100		0.114108	9'-10¾	Pf	5.441
106	9'-0	15.52	5.6	7.685		Sprinkler,	37'-9½	Pe	-0.436
526	10'-0			12.690		PO(3'-6¾), E(1'-5), T(3'-6¾), fd(29'-2¾)	47'-8¼	Pv	
BL	1.3800	31.95	6.85	100		0.114082	6'-8½	Pf	0.765
526	10'-0	16.43		12.690		Flow (q) from Route 9		Pe	
442	10'-0			13.454			6'-8½	Pv	
BL	1.3800	49.11	10.53	100		0.252645	16'-8	Pf	5.293
442	10'-0	17.15		13.454		Flow (q) from Route 11	4'-3¼	Pe	
446	10'-0			18.748		PO(4'-3¼)	20'-11½	Pv	
• • • • • Route 7 • • • • •									
DY	1.0490	15.65	5.81	120		0.082632	0'-0	Pf	3.801
107	9'-0	15.65	5.6	7.806		Sprinkler,	46'-0	Pe	-0.436
365	10'-0			11.172		PO(5'-0), fd(41'-0)	46'-0	Pv	
• • • • • Route 8 • • • • •									
DY	1.0490	16.36	6.07	120		0.089700	0'-0	Pf	4.126
108	9'-0	16.36	5.6	8.531		Sprinkler,	46'-0	Pe	-0.436
488	10'-0			12.221		PO(5'-0), fd(41'-0)	46'-0	Pv	
• • • • • Route 9 • • • • •									
BL	1.0490	16.43	6.10	120		0.090417	4'-0	Pf	4.521
109	9'-0	16.43	5.6	8.605		Sprinkler,	46'-0	Pe	-0.436
526	10'-0			12.690		T(5'-0), fd(41'-0)	50'-0	Pv	
• • • • • Route 10 • • • • •									
DY	1.0490	17.12	6.35	120		0.097579	0'-0	Pf	4.489
110	9'-0	17.12	5.6	9.344		Sprinkler,	46'-0	Pe	-0.436
366	10'-0			13.397		PO(5'-0), fd(41'-0)	46'-0	Pv	
• • • • • Route 11 • • • • •									
DY	1.0490	17.15	6.37	120		0.097965	0'-0	Pf	4.506
111	9'-0	17.15	5.6	9.384		Sprinkler,	46'-0	Pe	-0.436
442	10'-0			13.454		PO(5'-0), fd(41'-0)	46'-0	Pv	
• • • • • Route 12 • • • • •									
DY	1.0490	20.56	7.63	120		0.136934	0'-0	Pf	6.299
112	9'-0	20.56	5.6	13.477		Sprinkler,	46'-0	Pe	-0.436
289	10'-0			19.341		PO(5'-0), fd(41'-0)	46'-0	Pv	
BL	1.3800	20.56	4.41	100		0.050462	31'-9½	Pf	1.821
289	10'-0			19.341			4'-3¼	Pe	
295	10'-0			21.161		PO(4'-3¼)	36'-1	Pv	
• • • • • Route 13 • • • • •									
BL	2.4690	45.61	3.06	120		0.009254	4'-6½	Pf	0.218
19	3'-8½			42.205			19'-0	Pe	-0.327
67	4'-5½			42.096		3LtE(4'-0), BV(7'-0)	23'-6½	Pv	

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary	
DY	4.2600	45.61	1.03	120		0.000650	0'-0	Pf	0.017
67	4'-5½			42.096			26'-4	Pe	-0.235
56	5'-0			41.879		T(26'-4)	26'-4	Pv	
• • • • • Route 14 • • • • •									
BL	2.0670	45.61	4.36	120		0.021988	6'-11¼	Pf	1.142
59	6'-6¾			39.827		PO(10'-0)	45'-0	Pe	1.237
19	3'-8½			42.205		5E(5'-0), BalV, T(10'-0)	51'-11¼	Pv	
• • • • • Route 15 • • • • •									
FR	1.6820	50.05	7.23	100		0.099830	12'-0	Pf	1.198
335	10'-0	35.07		23.515		Flow (q) from Route 19		Pe	
257	10'-0			24.713			12'-0	Pv	
FR	1.6820	61.73	8.91	100		0.147156	12'-0	Pf	1.766
257	10'-0	11.68		24.713		Flow (q) from Route 25		Pe	
172	10'-0			26.479			12'-0	Pv	
FR	1.6820	72.03	10.40	100		0.195793	7'-6	Pf	1.468
172	10'-0	10.30		26.479		Flow (q) from Route 23		Pe	
126	10'-0			27.948			7'-6	Pv	
FR	1.6820	83.42	12.05	100		0.256895	8'-1¾	Pf	3.906
126	10'-0	11.39		27.948		Flow (q) from Route 21	7'-0¾	Pe	
90	10'-0			31.853		T(7'-0¾)	15'-2½	Pv	
BL	2.0670	83.42	7.98	100		0.094150	47'-5¾	Pf	5.141
90	10'-0			31.853			7'-1½	Pe	
91	10'-0			36.995		T(7'-1½)	54'-7¼	Pv	
• • • • • Route 16 • • • • •									
FR	1.6820	35.07	5.06	100		0.051691	12'-0	Pf	0.620
426	10'-0	17.90		22.895		Flow (q) from Route 29		Pe	
335	10'-0			23.515			12'-0	Pv	
• • • • • Route 17 • • • • •									
BL	1.3800	17.17	3.68	100		0.036165	98'-5½	Pf	3.870
408	10'-0			19.025		PO(4'-3¼)	8'-6¾	Pe	
426	10'-0			22.895		PO(4'-3¼)	107'-0¼	Pv	
• • • • • Route 18 • • • • •									
BL	1.3800	10.30	2.21	100		0.014058	98'-5½	Pf	1.504
155	10'-0			24.975		PO(4'-3¼)	8'-6¾	Pe	
172	10'-0			26.479		PO(4'-3¼)	107'-0¼	Pv	
• • • • • Route 19 • • • • •									
BL	1.3800	11.68	2.51	100		0.017728	98'-5½	Pf	1.897
240	10'-0			22.816		PO(4'-3¼)	8'-6¾	Pe	
257	10'-0			24.713		PO(4'-3¼)	107'-0¼	Pv	
• • • • • Route 20 • • • • •									
FR	1.6820	17.90	2.58	100		0.014892	12'-6	Pf	0.186
511	10'-0			22.709				Pe	
426	10'-0			22.895			12'-6	Pv	
• • • • • Route 21 • • • • •									
BL	1.3800	17.90	3.84	100		0.039040	98'-5½	Pf	4.178
491	10'-0			18.531		PO(4'-3¼)	8'-6¾	Pe	
511	10'-0			22.709		PO(4'-3¼)	107'-0¼	Pv	
• • • • • Route 22 • • • • •									
BL	1.3800	11.39	2.44	100		0.016928	98'-5½	Pf	1.811
113	10'-0			26.136		PO(4'-3¼)	8'-6¾	Pe	
126	10'-0			27.948		PO(4'-3¼)	107'-0¼	Pv	
• • • • • Route 23 • • • • •									
BL	1.3800	14.98	3.21	100		0.028107	98'-5½	Pf	3.008
315	10'-0			20.508		PO(4'-3¼)	8'-6¾	Pe	
335	10'-0			23.515		PO(4'-3¼)	107'-0¼	Pv	

Equivalent Pipe Lengths of Valves and Fittings (C=120 only)

$$\left(\frac{\text{Actual Inside Diameter}}{\text{Schedule 40 Steel Pipe Inside Diameter}}\right)^{4.87} = \text{Factor}$$

C Value Multiplier

Value Of C	100	130	140	150
Multiplying Factor	0.713	1.16	1.33	1.51

Pipe Type	Diameter	Flow	Velocity	HWC		Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Fittings	Eq. Length	Summary
Upstream							Total Length	

Pipe Type Legend

AO	Arm-Over
BL	Branch Line
CM	Cross Main
DN	Drain
DR	Drop
DY	Dynamic
FM	Feed Main
FR	Feed Riser
MS	Miscellaneous
OR	Outrigger
RN	Riser Nipple
SP	Sprig
ST	Stand Pipe
UG	Underground

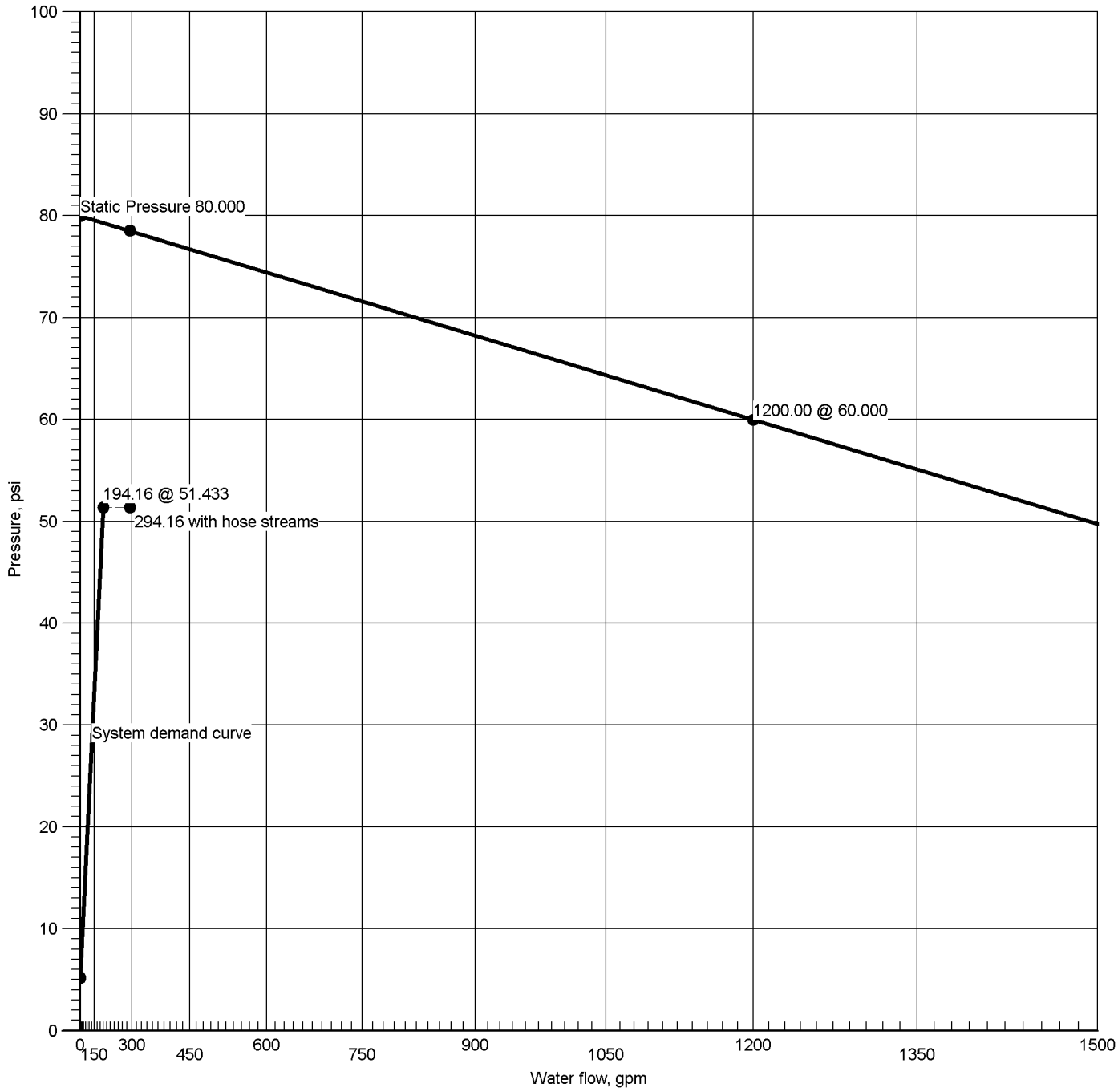
Units Legend

Diameter	Inch
Elevation	Foot
Flow	gpm
Discharge	gpm
Velocity	fps
Pressure	psi
Length	Foot
Friction Loss	psi/Foot
HWC	Hazen-Williams Constant
Pt	Total pressure at a point in a pipe
Pn	Normal pressure at a point in a pipe
Pf	Pressure loss due to friction between points
Pe	Pressure due to elevation difference between indicated points
Pv	Velocity pressure at a point in a pipe

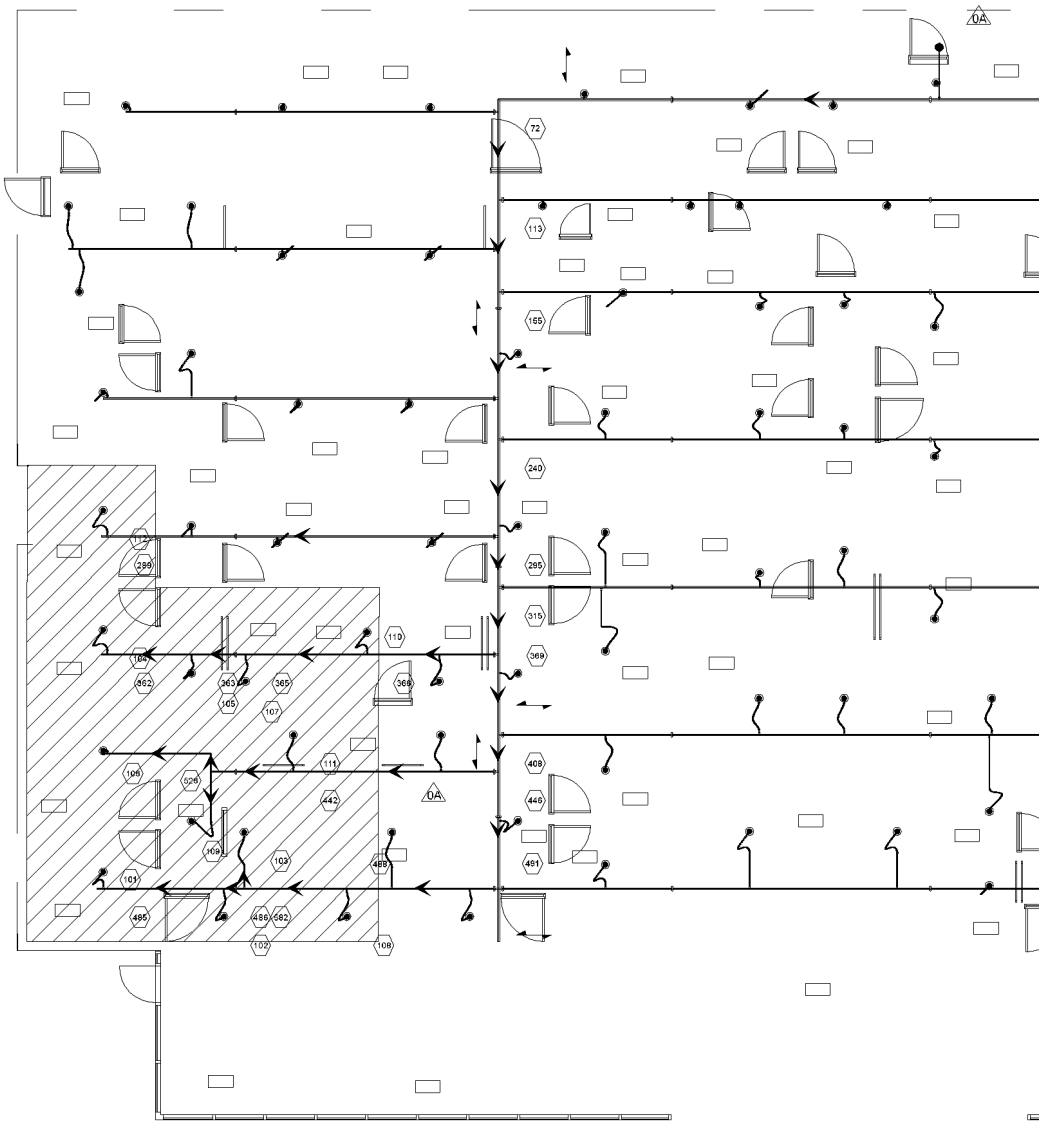
Fittings Legend

ALV	Alarm Valve
AngV	Angle Valve
b	Bushing
BalV	Ball Valve
BFP	Backflow Preventer
BV	Butterfly Valve
C	Cross Flow Turn 90°
cplg	Coupling
Cr	Cross Run
CV	Check Valve
DelV	Deluge Valve
DPV	Dry Pipe Valve
E	90° Elbow
EE	45° Elbow
Ee1	11¼° Elbow
Ee2	22½° Elbow
f	Flow Device
fd	Flex Drop
FDC	Fire Department Connection
fE	90° FireLock(TM) Elbow
fEE	45° FireLock(TM) Elbow
flg	Flange
FN	Floating Node
fT	FireLock(TM) Tee
g	Gauge
GloV	Globe Valve
GV	Gate Valve
Ho	Hose
Hose	Hose
HV	Hose Valve
Hyd	Hydrant
LtE	Long Turn Elbow
mecT	Mechanical Tee
Noz	Nozzle
P1	Pump In
P2	Pump Out
PIV	Post Indicating Valve
PO	Pipe Outlet
PRV	Pressure Reducing Valve
PrV	Pressure Relief Valve
red	Reducer/Adapter
S	Supply
sCV	Swing Check Valve
Spr	Sprinkler
St	Strainer
T	Tee Flow Turn 90°
Tr	Tee Run
U	Union
WirF	Wirsbo
WMV	Water Meter Valve
Z	Cap

Supply at Node 2



Hydraulic Graph	Supply at Node 2
Static: Pressure	80.000
Residual: Pressure	60.000 @ 1200.00
Available Pressure at Time of Test	78.516 @ 294.16
System Demand	51.433 @ 194.16
System Demand (Including Hose Allowance at Source)	51.433 @ 294.16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101
495
486
562
102
108

LOWER WET

Hydraulic Overview

Job Number: 11-137
Report Description: Light Hazard (Lower Wet Calcs)

Job

Job Number: 11-137	Design Engineer: Franklin Callfas
Job Name: Wallowa Medical Hospital	Phone: (541) 848-1798 FAX
Address 1: Wallowa County Health Care District	State Certification/License Number
Address 2: Enterprise, Oregon, 97828	AHJ
Address 3	Job Site/Building

System

Density: 0.100gpm/ft²	Area of Application: 1500.00ft² (Actual 927.97ft²)
Most Demanding Sprinkler Data: 5.6 K-Factor 14.82 at 7.000	Hose Streams: 100.00
Coverage Per Sprinkler: 100.00ft²	Number Of Sprinklers Calculated: 12
System Pressure Demand: 51.433	System Flow Demand: 194.16
Total Demand: 294.16 @ 51.433	Pressure Result: +27.083 (34.5%)

Supplies

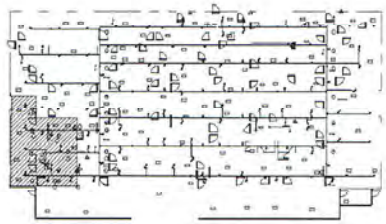
Node	Flow(gpm)	Hose Flow(gpm)	Static(psi)	Residual(psi)
2	1200.00	100.00	80.000	60.000

Check Point Gauges

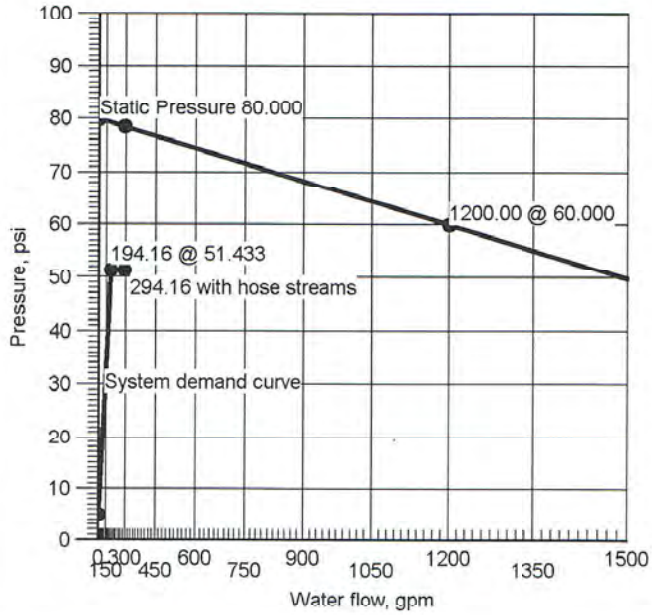
Identifier	Pressure(psi)	K-Factor(K)	Flow(gpm)

REGISTERED PROFESSIONAL ENGINEER
84637PE
OREGON
Nov. 19 2110
FRANKLIN D. CALLFAS
Expires 12-31-11

Wallowa Rev-0a



Supply at Node 2 (1200.00, 100.00, 80.000, 60.000)



Hydraulic Summary

Job

Job Number: 11-137	Design Engineer: Franklin Callfas
Job Name: Wallowa Medical Hospital	State Certification/License Number:
Address 1: Wallowa County Health Care District	AHJ:
Address 2: Enterprise, Oregon, 97828	Job Site/Building:
Address 3:	Drawing Name: Wallowa Rev-0a

System

Most Demanding Sprinkler Data: 5.6 K-Factor 14.82 at 7.000	
Hose Allowance At Source: 100.00	
Additional Hose Supplies: Node / Flow(gpm)	
Total Hose Streams: 100.00	
System Flow Demand: 194.16	Total Water Required (Including Hose Allowance): 294.16
Maximum Pressure Unbalance In Loops: 0.000	
Maximum Velocity Above Ground: 14.20 between nodes 45 and 47	
Maximum Velocity Under Ground: 4.45 between nodes 2 and 5	
Volume capacity of Wet Pipes: 89.79gal	Volume capacity of Dry Pipes: 388.01gal

Remote Area(s)

Occupancy: Light Hazard (Lower Wet Calcs)	Job Suffix:
Density: 0.100gpm/ft²	Area of Application: 1500.00ft² (Actual 927.97ft²)
Number Of Sprinklers Calculated: 12	Coverage Per Sprinkler: 100.00ft²
AutoPeak Results: Pressure For Remote Area(s) Adjacent To Most Remote Area	

Supplies

Node	Hose Flow (gpm)	Static (psi)	Residual (psi)	@	Flow (gpm)	Available (psi)	@	Total Demand (gpm)	Required (psi)	Safety Margin (psi)
2	100.00	80.000	60.000		1200.00	78.516		294.16	51.433	27.083

Contractor

Contractor Number:	Contact Name: / Contact Title:
Name of Contractor:	Phone: / Extension:
Address 1:	FAX:
Address 2:	E-mail:
Address 3:	Web-Site:

Summary Of Outflowing Devices

Job Number: 11-137
Report Description: Light Hazard (Lower Wet Calcs)

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)		
Sprinkler	**101**	**14.82**	**10.00**	**5.6**	**7.000**		
Sprinkler	102	15.01	10.00	5.6	7.186		
Sprinkler	103	15.04	10.00	5.6	7.216		
Sprinkler	104	15.18	10.00	5.6	7.353		
Sprinkler	105	15.32	10.00	5.6	7.488		
Sprinkler	106	15.52	10.00	5.6	7.685		
Sprinkler	107	15.65	10.00	5.6	7.806		
Sprinkler	108	16.36	10.00	5.6	8.531		
Sprinkler	109	16.43	10.00	5.6	8.605		
Sprinkler	110	17.12	10.00	5.6	9.344		
Sprinkler	111	17.15	10.00	5.6	9.384		
Sprinkler	112	20.56	10.00	5.6	13.477		

Most Demanding Sprinkler Data

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)	
2	-3'-0	S	51.433	194.16	
101	9'-0	Spr(-7.000), fd(41'-0)	7.000	14.82	
102	9'-0	Spr(-7.186), fd(41'-0)	7.186	15.01	
103	9'-0	Spr(-7.216), fd(41'-0)	7.216	15.04	
104	9'-0	Spr(-7.353), fd(41'-0)	7.353	15.18	
105	9'-0	Spr(-7.488), fd(41'-0)	7.488	15.32	
106	9'-0	Spr(-7.685), fd(29'-2¾)	7.685	15.52	
107	9'-0	Spr(-7.806), fd(41'-0)	7.806	15.65	
108	9'-0	Spr(-8.531), fd(41'-0)	8.531	16.36	
109	9'-0	Spr(-8.605), fd(41'-0)	8.605	16.43	
110	9'-0	Spr(-9.344), fd(41'-0)	9.344	17.12	
111	9'-0	Spr(-9.384), fd(41'-0)	9.384	17.15	
112	9'-0	Spr(-13.477), fd(41'-0)	13.477	20.56	
1	-0'-10¼		0.000		
4	-0'-6		0.000		
5	0'-0		49.346		
7	-0'-6		0.000		
19	3'-8½	T(10'-0)	42.205		
32	3'-1	BFP(-5.000)	47.972		
44	5'-6½		41.492		
45	5'-8		41.438		
47	5'-11¼		40.150		
52	10'-0	LtE(2'-10¼)	37.857		
56	5'-0	T(26'-4)	41.879		
59	6'-6¾	PO(10'-0)	39.827		
67	4'-5½		42.096		
72	10'-0	E(4'-4¾)	27.755		
90	10'-0	T(7'-0¾)	31.853		
91	10'-0	T(7'-1½)	36.995		
113	10'-0	PO(4'-3¼)	26.136		
126	10'-0	PO(4'-3¼)	27.948		
155	10'-0	PO(4'-3¼)	24.975		
172	10'-0	PO(4'-3¼)	26.479		
240	10'-0	PO(4'-3¼)	22.816		
257	10'-0	PO(4'-3¼)	24.713		
289	10'-0	PO(5'-0)	19.341		
295	10'-0	PO(4'-3¼)	21.161		
315	10'-0	PO(4'-3¼)	20.508		
335	10'-0	PO(4'-3¼)	23.515		
362	10'-0	PO(5'-0)	10.513		
363	10'-0	PO(5'-0)	10.710		
365	10'-0	PO(5'-0)	11.172		
366	10'-0	PO(5'-0)	13.397		
369	10'-0	PO(4'-3¼)	19.438		
408	10'-0	PO(4'-3¼)	19.025		
426	10'-0	PO(4'-3¼)	22.895		
442	10'-0	PO(5'-0)	13.454		
446	10'-0	PO(4'-3¼)	18.748		
485	10'-0	PO(5'-0)	10.001		
486	10'-0	PO(5'-0)	10.271		
488	10'-0	PO(5'-0)	12.221		
491	10'-0	PO(4'-3¼)	18.531		
511	10'-0	PO(4'-3¼)	22.709		
526	10'-0	T(5'-0)	12.690		
531	12'-10½	PO(6'-0)	38.730		
532	12'-10¾	PO(6'-0)	38.715		
534	12'-11¼	PO(6'-0)	38.699		
536	12'-11¾	PO(6'-0)	38.683		
539	13'-0¼	PO(6'-0)	38.666		
542	12'-11½	PO(6'-0)	38.694		
544	12'-11	PO(6'-0)	38.709		
546	12'-10½	PO(6'-0)	38.724		

Node Analysis

Job Number: 11-137
Report Description: Light Hazard (Lower Wet Calcs)

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)	
582	10'-0	PO(5'-0)	10.437		

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary	
• • • • • Route 1 • • • • •									
DY	1.0490	14.82	5.50	120		0.074703	0'-0	Pf	3.436
101	9'-0	14.82	5.6	7.000		Sprinkler,	46'-0	Pe	-0.436
485	10'-0			10.001		PO(5'-0), fd(41'-0)	46'-0	Pv	
BL	1.3800	14.82	3.18	100		0.027529	9'-9¾	Pf	0.270
485	10'-0			10.001				Pe	
486	10'-0			10.271			9'-9¾	Pv	
BL	1.3800	29.83	6.40	100		0.100455	1'-7¾	Pf	0.166
486	10'-0	15.01		10.271		Flow (q) from Route 2		Pe	
582	10'-0			10.437			1'-7¾	Pv	
BL	1.3800	44.87	9.62	100		0.213829	8'-4¼	Pf	1.785
582	10'-0	15.04		10.437		Flow (q) from Route 3		Pe	
488	10'-0			12.221			8'-4¼	Pv	
BL	1.3800	61.23	13.13	100		0.379994	12'-4	Pf	6.310
488	10'-0	16.36		12.221		Flow (q) from Route 8	4'-3¼	Pe	
491	10'-0			18.531		PO(4'-3¼)	16'-7¼	Pv	
FR	2.1570	43.33	3.80	100		0.022771	9'-6	Pf	0.216
491	10'-0			18.531				Pe	
446	10'-0			18.748			9'-6	Pv	
FR	2.1570	92.44	8.12	100		0.092492	3'-0	Pf	0.277
446	10'-0	49.11		18.748		Flow (q) from Route 6		Pe	
408	10'-0			19.025			3'-0	Pv	
FR	2.1570	75.27	6.61	100		0.063241	6'-6¼	Pf	0.413
408	10'-0			19.025				Pe	
369	10'-0			19.438			6'-6¼	Pv	
FR	2.1570	138.54	12.16	100		0.195524	5'-5¾	Pf	1.070
369	10'-0	63.27		19.438		Flow (q) from Route 4		Pe	
315	10'-0			20.508			5'-5¾	Pv	
FR	2.1570	123.56	10.85	100		0.158211	4'-1½	Pf	0.654
315	10'-0			20.508				Pe	
295	10'-0			21.161			4'-1½	Pv	
FR	2.1570	144.11	12.65	100		0.210329	7'-10½	Pf	1.655
295	10'-0	20.56		21.161		Flow (q) from Route 12		Pe	
240	10'-0			22.816			7'-10½	Pv	
FR	2.1570	132.44	11.63	100		0.179885	12'-0	Pf	2.159
240	10'-0			22.816				Pe	
155	10'-0			24.975			12'-0	Pv	
FR	2.1570	122.13	10.72	100		0.154854	7'-6	Pf	1.161
155	10'-0			24.975				Pe	
113	10'-0			26.136			7'-6	Pv	
FR	2.1570	110.74	9.72	100		0.129198	8'-1¾	Pf	1.619
113	10'-0			26.136			4'-4¾	Pe	
72	10'-0			27.755		E(4'-4¾)	12'-6½	Pv	
BL	2.0670	110.74	10.59	100		0.159000	50'-11¾	Pf	9.239
72	10'-0			27.755			7'-1½	Pe	
91	10'-0			36.995		T(7'-1½)	58'-1¼	Pv	
BL	2.4690	194.16	13.01	100		0.189093	1'-8½	Pf	0.862
91	10'-0	83.42		36.995		Flow (q) from Route 16	2'-10¼	Pe	
52	10'-0			37.857		LtE(2'-10¼)	4'-6¾	Pv	
FR	2.6350	194.16	11.42	100		0.137737	3'-5¼	Pf	0.475
52	10'-0			37.857				Pe	1.495
59	6'-6¾			39.827			3'-5¼	Pv	
FR	2.6350	148.56	8.74	100		0.083933	0'-7½	Pf	0.052
59	6'-6¾			39.827				Pe	0.271
47	5'-11¼			40.150			0'-7½	Pv	
DY	2.0670	148.56	14.20	120		0.195408	0'-0	Pf	1.172
47	5'-11¼			40.150			6'-0	Pe	0.115
45	5'-8			41.438		BV(6'-0)	6'-0	Pv	
DY	2.4690	148.56	9.95	120		0.082238	0'-0	Pf	0.000
45	5'-8			41.438				Pe	0.054
44	5'-6½			41.492			0'-0	Pv	
DY	4.2600	148.56	3.34	120		0.005773	0'-0	Pf	0.152
44	5'-6½			41.492			26'-4	Pe	0.235
56	5'-0			41.879		T(26'-4)	26'-4	Pv	
FR	4.2600	194.16	4.37	120		0.009474	1'-4	Pf	5.262
56	5'-0	45.61		41.879		Flow (q) from Route 13	26'-4	Pe	0.831
32	3'-1			47.972		T(26'-4), BFP(-5.000)	27'-8	Pv	
FR	4.2600	194.16	4.37	100		0.013275	3'-1	Pf	0.041
32	3'-1			47.972				Pe	1.333
5	0'-0			49.346			3'-1	Pv	
UG	4.2200	194.16	4.45	140		0.007458	88'-3	Pf	0.783
5	0'-0			49.346		Supply,	16'-8¾	Pe	1.304
2	-3'-0			51.433		E(16'-8¾), S	104'-11¾	Pv	

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary	
		100.00				Hose Allowance At Source			
2		294.16							
• • • • • Route 2 • • • • •									
DY	1.0490	15.01	5.57	120		0.076535	0'-0	Pf	3.521
102	9'-0	15.01	5.6	7.186		Sprinkler,	46'-0	Pe	-0.436
486	10'-0			10.271		PO(5'-0), fd(41'-0)	46'-0	Pv	
• • • • • Route 3 • • • • •									
BL	1.0490	15.04	5.58	120		0.076837	1'-7	Pf	3.656
103	9'-0	15.04	5.6	7.216		Sprinkler,	46'-0	Pe	-0.436
582	10'-0			10.437		PO(5'-0), fd(41'-0)	47'-7	Pv	
• • • • • Route 4 • • • • •									
DY	1.0490	15.18	5.64	120		0.078180	0'-0	Pf	3.596
104	9'-0	15.18	5.6	7.353		Sprinkler,	46'-0	Pe	-0.436
362	10'-0			10.513		PO(5'-0), fd(41'-0)	46'-0	Pv	
BL	1.3800	15.18	3.26	100		0.028810	6'-10	Pf	0.197
362	10'-0			10.513				Pe	
363	10'-0			10.710			6'-10	Pv	
BL	1.3800	30.51	6.54	100		0.104744	4'-5	Pf	0.462
363	10'-0	15.32		10.710		Flow (q) from Route 5		Pe	
365	10'-0			11.172			4'-5	Pv	
BL	1.3800	46.16	9.90	100		0.225293	9'-10½	Pf	2.225
365	10'-0	15.65		11.172		Flow (q) from Route 7		Pe	
366	10'-0			13.397			9'-10½	Pv	
BL	1.3800	63.27	13.57	100		0.403822	10'-8¼	Pf	6.041
366	10'-0	17.12		13.397		Flow (q) from Route 10	4'-3¼	Pe	
369	10'-0			19.438		PO(4'-3¼)	14'-11½	Pv	
• • • • • Route 5 • • • • •									
DY	1.0490	15.32	5.69	120		0.079513	0'-0	Pf	3.658
105	9'-0	15.32	5.6	7.488		Sprinkler,	46'-0	Pe	-0.436
363	10'-0			10.710		PO(5'-0), fd(41'-0)	46'-0	Pv	
• • • • • Route 6 • • • • •									
BL	1.0490	15.52	5.76	100		0.114108	9'-10¾	Pf	5.441
106	9'-0	15.52	5.6	7.685		Sprinkler,	37'-9½	Pe	-0.436
526	10'-0			12.690		PO(3'-6¾), E(1'-5), T(3'-6¾), fd(29'-2¾)	47'-8¼	Pv	
BL	1.3800	31.95	6.85	100		0.114082	6'-8½	Pf	0.765
526	10'-0	16.43		12.690		Flow (q) from Route 9		Pe	
442	10'-0			13.454			6'-8½	Pv	
BL	1.3800	49.11	10.53	100		0.252645	16'-8	Pf	5.293
442	10'-0	17.15		13.454		Flow (q) from Route 11	4'-3¼	Pe	
446	10'-0			18.748		PO(4'-3¼)	20'-11½	Pv	
• • • • • Route 7 • • • • •									
DY	1.0490	15.65	5.81	120		0.082632	0'-0	Pf	3.801
107	9'-0	15.65	5.6	7.806		Sprinkler,	46'-0	Pe	-0.436
365	10'-0			11.172		PO(5'-0), fd(41'-0)	46'-0	Pv	
• • • • • Route 8 • • • • •									
DY	1.0490	16.36	6.07	120		0.089700	0'-0	Pf	4.126
108	9'-0	16.36	5.6	8.531		Sprinkler,	46'-0	Pe	-0.436
488	10'-0			12.221		PO(5'-0), fd(41'-0)	46'-0	Pv	
• • • • • Route 9 • • • • •									
BL	1.0490	16.43	6.10	120		0.090417	4'-0	Pf	4.521
109	9'-0	16.43	5.6	8.605		Sprinkler,	46'-0	Pe	-0.436
526	10'-0			12.690		T(5'-0), fd(41'-0)	50'-0	Pv	
• • • • • Route 10 • • • • •									
DY	1.0490	17.12	6.35	120		0.097579	0'-0	Pf	4.489
110	9'-0	17.12	5.6	9.344		Sprinkler,	46'-0	Pe	-0.436
366	10'-0			13.397		PO(5'-0), fd(41'-0)	46'-0	Pv	
• • • • • Route 11 • • • • •									
DY	1.0490	17.15	6.37	120		0.097965	0'-0	Pf	4.506
111	9'-0	17.15	5.6	9.384		Sprinkler,	46'-0	Pe	-0.436
442	10'-0			13.454		PO(5'-0), fd(41'-0)	46'-0	Pv	
• • • • • Route 12 • • • • •									
DY	1.0490	20.56	7.63	120		0.136934	0'-0	Pf	6.299
112	9'-0	20.56	5.6	13.477		Sprinkler,	46'-0	Pe	-0.436
289	10'-0			19.341		PO(5'-0), fd(41'-0)	46'-0	Pv	
BL	1.3800	20.56	4.41	100		0.050462	31'-9½	Pf	1.821
289	10'-0			19.341			4'-3¼	Pe	
295	10'-0			21.161		PO(4'-3¼)	36'-1	Pv	
• • • • • Route 13 • • • • •									
BL	2.4690	45.61	3.06	120		0.009254	4'-6½	Pf	0.218
19	3'-8½			42.205			19'-0	Pe	-0.327
67	4'-5½			42.096		3LtE(4'-0), BV(7'-0)	23'-6½	Pv	

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary	
DY	4.2600	45.61	1.03	120		0.000650	0'-0	Pf	0.017
67	4'-5½			42.096			26'-4	Pe	-0.235
56	5'-0			41.879		T(26'-4)	26'-4	Pv	
• • • • • Route 14 • • • • •									
BL	2.0670	45.61	4.36	120		0.021988	6'-11¼	Pf	1.142
59	6'-6¾			39.827		PO(10'-0)	45'-0	Pe	1.237
19	3'-8½			42.205		5E(5'-0), BalV, T(10'-0)	51'-11¼	Pv	
• • • • • Route 15 • • • • •									
FR	1.6820	50.05	7.23	100		0.099830	12'-0	Pf	1.198
335	10'-0	35.07		23.515		Flow (q) from Route 19		Pe	
257	10'-0			24.713			12'-0	Pv	
FR	1.6820	61.73	8.91	100		0.147156	12'-0	Pf	1.766
257	10'-0	11.68		24.713		Flow (q) from Route 25		Pe	
172	10'-0			26.479			12'-0	Pv	
FR	1.6820	72.03	10.40	100		0.195793	7'-6	Pf	1.468
172	10'-0	10.30		26.479		Flow (q) from Route 23		Pe	
126	10'-0			27.948			7'-6	Pv	
FR	1.6820	83.42	12.05	100		0.256895	8'-1¾	Pf	3.906
126	10'-0	11.39		27.948		Flow (q) from Route 21	7'-0¾	Pe	
90	10'-0			31.853		T(7'-0¾)	15'-2½	Pv	
BL	2.0670	83.42	7.98	100		0.094150	47'-5¾	Pf	5.141
90	10'-0			31.853			7'-1½	Pe	
91	10'-0			36.995		T(7'-1½)	54'-7¼	Pv	
• • • • • Route 16 • • • • •									
FR	1.6820	35.07	5.06	100		0.051691	12'-0	Pf	0.620
426	10'-0	17.90		22.895		Flow (q) from Route 29		Pe	
335	10'-0			23.515			12'-0	Pv	
• • • • • Route 17 • • • • •									
BL	1.3800	17.17	3.68	100		0.036165	98'-5½	Pf	3.870
408	10'-0			19.025		PO(4'-3¼)	8'-6¾	Pe	
426	10'-0			22.895		PO(4'-3¼)	107'-0¼	Pv	
• • • • • Route 18 • • • • •									
BL	1.3800	10.30	2.21	100		0.014058	98'-5½	Pf	1.504
155	10'-0			24.975		PO(4'-3¼)	8'-6¾	Pe	
172	10'-0			26.479		PO(4'-3¼)	107'-0¼	Pv	
• • • • • Route 19 • • • • •									
BL	1.3800	11.68	2.51	100		0.017728	98'-5½	Pf	1.897
240	10'-0			22.816		PO(4'-3¼)	8'-6¾	Pe	
257	10'-0			24.713		PO(4'-3¼)	107'-0¼	Pv	
• • • • • Route 20 • • • • •									
FR	1.6820	17.90	2.58	100		0.014892	12'-6	Pf	0.186
511	10'-0			22.709				Pe	
426	10'-0			22.895			12'-6	Pv	
• • • • • Route 21 • • • • •									
BL	1.3800	17.90	3.84	100		0.039040	98'-5½	Pf	4.178
491	10'-0			18.531		PO(4'-3¼)	8'-6¾	Pe	
511	10'-0			22.709		PO(4'-3¼)	107'-0¼	Pv	
• • • • • Route 22 • • • • •									
BL	1.3800	11.39	2.44	100		0.016928	98'-5½	Pf	1.811
113	10'-0			26.136		PO(4'-3¼)	8'-6¾	Pe	
126	10'-0			27.948		PO(4'-3¼)	107'-0¼	Pv	
• • • • • Route 23 • • • • •									
BL	1.3800	14.98	3.21	100		0.028107	98'-5½	Pf	3.008
315	10'-0			20.508		PO(4'-3¼)	8'-6¾	Pe	
335	10'-0			23.515		PO(4'-3¼)	107'-0¼	Pv	

Equivalent Pipe Lengths of Valves and Fittings (C=120 only)

$$\left(\frac{\text{Actual Inside Diameter}}{\text{Schedule 40 Steel Pipe Inside Diameter}}\right)^{4.87} = \text{Factor}$$

C Value Multiplier

Value Of C	100	130	140	150
Multiplying Factor	0.713	1.16	1.33	1.51

Pipe Type	Diameter	Flow	Velocity	HWC		Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Fittings	Eq. Length	Summary
Upstream							Total Length	

Pipe Type Legend

AO	Arm-Over
BL	Branch Line
CM	Cross Main
DN	Drain
DR	Drop
DY	Dynamic
FM	Feed Main
FR	Feed Riser
MS	Miscellaneous
OR	Outrigger
RN	Riser Nipple
SP	Sprig
ST	Stand Pipe
UG	Underground

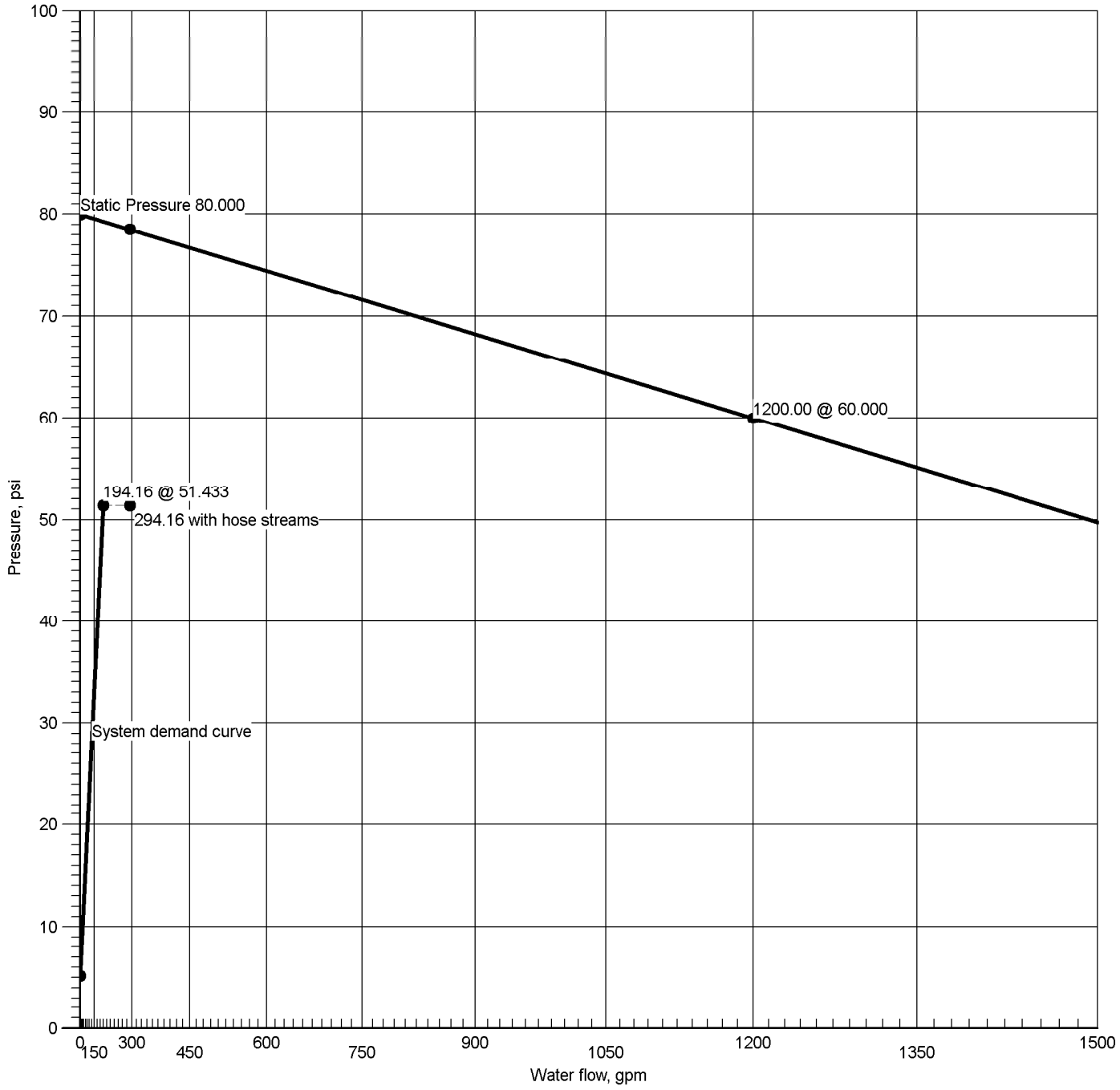
Units Legend

Diameter	Inch
Elevation	Foot
Flow	gpm
Discharge	gpm
Velocity	fps
Pressure	psi
Length	Foot
Friction Loss	psi/Foot
HWC	Hazen-Williams Constant
Pt	Total pressure at a point in a pipe
Pn	Normal pressure at a point in a pipe
Pf	Pressure loss due to friction between points
Pe	Pressure due to elevation difference between indicated points
Pv	Velocity pressure at a point in a pipe

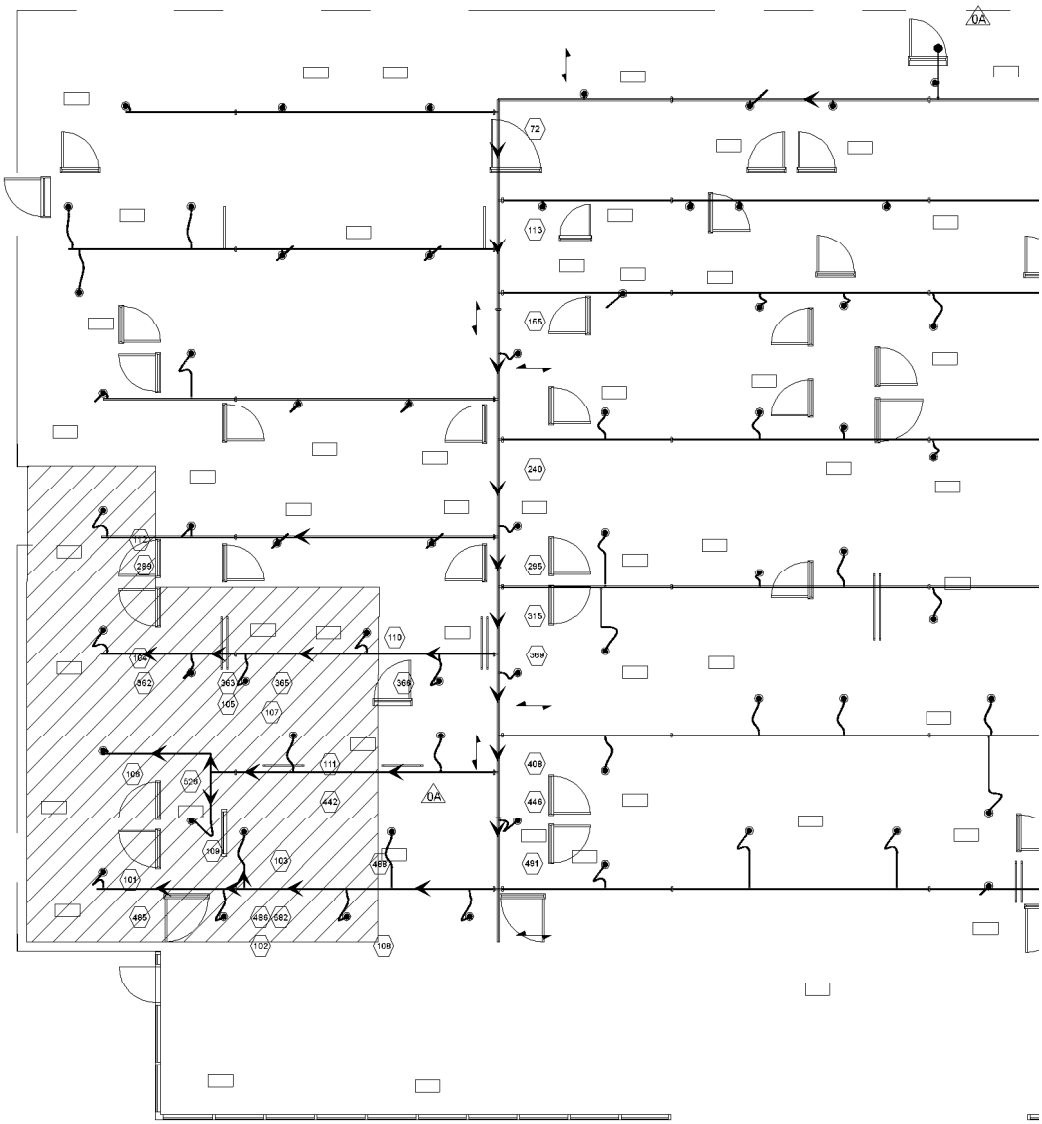
Fittings Legend

ALV	Alarm Valve
AngV	Angle Valve
b	Bushing
BalV	Ball Valve
BFP	Backflow Preventer
BV	Butterfly Valve
C	Cross Flow Turn 90°
cplg	Coupling
Cr	Cross Run
CV	Check Valve
DelV	Deluge Valve
DPV	Dry Pipe Valve
E	90° Elbow
EE	45° Elbow
Ee1	11¼° Elbow
Ee2	22½° Elbow
f	Flow Device
fd	Flex Drop
FDC	Fire Department Connection
fE	90° FireLock(TM) Elbow
fEE	45° FireLock(TM) Elbow
flg	Flange
FN	Floating Node
fT	FireLock(TM) Tee
g	Gauge
GloV	Globe Valve
GV	Gate Valve
Ho	Hose
Hose	Hose
HV	Hose Valve
Hyd	Hydrant
LtE	Long Turn Elbow
mecT	Mechanical Tee
Noz	Nozzle
P1	Pump In
P2	Pump Out
PIV	Post Indicating Valve
PO	Pipe Outlet
PRV	Pressure Reducing Valve
PrV	Pressure Relief Valve
red	Reducer/Adapter
S	Supply
sCV	Swing Check Valve
Spr	Sprinkler
St	Strainer
T	Tee Flow Turn 90°
Tr	Tee Run
U	Union
WirF	Wirsbo
WMV	Water Meter Valve
Z	Cap

Supply at Node 2



Hydraulic Graph	Supply at Node 2
Static: Pressure	80.000
Residual: Pressure	60.000 @ 1200.00
Available Pressure at Time of Test	78.516 @ 294.16
System Demand	51.433 @ 194.16
System Demand (Including Hose Allowance at Source)	51.433 @ 294.16


DA
72
113
155
240
295
315
JOIN
409
446
491
112
299
110
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362
363
365
366
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526
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442
DA
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562
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Hydraulic Overview

Job Number: 11-137
Report Description: Light Hazard (Attic Dry Calcs)

Job

Job Number 11-137	Design Engineer Franklin Callfas
Job Name: Wallowa Medical Hospital	Phone (541) 848-1798 / FAX
Address 1 Wallowa County Health Care District	State Certification/License Number
Address 2 Enterprise, Oregon, 97828	AHJ
Address 3	Job Site/Building

System

Density 0.100gpm/ft²	Area of Application 1500.00ft² (Actual 1387.30ft²)
Most Demanding Sprinkler Data 8.1 K-Factor 38.00 at 22.009	Hose Streams 100.00
Coverage Per Sprinkler 100.00ft²	Number Of Sprinklers Calculated 9
System Pressure Demand 70.615	System Flow Demand 323.43
Total Demand 423.43 @ 70.615	Pressure Result +6.473 (8.4%)

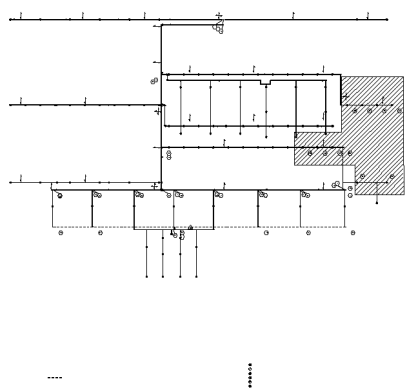
Supplies

Node	Flow(gpm)	Hose Flow(gpm)	Static(psi)	Residual(psi)
2	1200.00	100.00	80.000	60.000

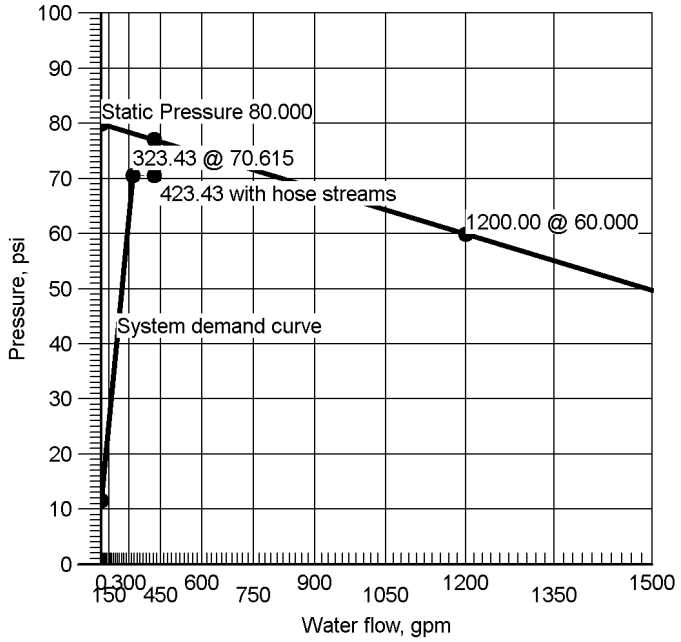
Check Point Gauges

Identifier	Pressure(psi)	K-Factor(K)	Flow(gpm)

Wallowa Rev-0a



Supply at Node 2 (1200.00, 100.00, 80.000, 60.000)



Hydraulic Summary

Job

Job Number: 11-137	Design Engineer: Franklin Callfas
Job Name: Wallowa Medical Hospital	State Certification/License Number:
Address 1: Wallowa County Health Care District	AHJ:
Address 2: Enterprise, Oregon, 97828	Job Site/Building:
Address 3:	Drawing Name: Wallowa Rev-0a

System

Most Demanding Sprinkler Data: 8.1 K-Factor 38.00 at 22.009

Hose Allowance At Source: 100.00

Additional Hose Supplies

Node	Flow(gpm)

Total Hose Streams: 100.00

System Flow Demand: 323.43

Total Water Required (Including Hose Allowance): 423.43

Maximum Pressure Unbalance In Loops: 0.000

Maximum Velocity Above Ground: 14.51 between nodes 647 and 587

Maximum Velocity Under Ground: 7.42 between nodes 2 and 5

Volume capacity of Wet Pipes: 89.79gal

Volume capacity of Dry Pipes: 388.01gal

Remote Area(s)

Occupancy: Light Hazard (Attic Dry Calcs)

Job Suffix:

Density: 0.100gpm/ft²

Area of Application: 1500.00ft² (Actual 1387.30ft²)

Number Of Sprinklers Calculated: 9

Coverage Per Sprinkler: 100.00ft²

AutoPeak Results: Pressure For Remote Area(s) Adjacent To Most Remote Area

Supplies

Node	Hose Flow (gpm)	Static (psi)	Residual (psi)	@	Flow (gpm)	Available (psi)	@	Total Demand (gpm)	Required (psi)	Safety Margin (psi)
2	100.00	80.000	60.000		1200.00	77.089		423.43	70.615	6.473

Contractor

	Contractor Number	Contact Name	Contact Title
Name of Contractor:		Phone	Extension
Address 1		FAX	
Address 2		E-mail	
Address 3		Web-Site	

Summary Of Outflowing Devices

Job Number: 11-137
Report Description: Light Hazard (Attic Dry Calcs)

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)		
Sprinkler	**201**	**38.00**	**38.00**	**8.1**	**22.009**		
Sprinkler	202	38.07	38.00	8.1	22.085		
Sprinkler	203	38.30	38.00	8.1	22.361		
Sprinkler	204	38.80	38.00	8.1	22.949		
Sprinkler	205	34.37	25.00	5.6	37.676		
Sprinkler	206	34.40	25.00	5.6	37.742		
Sprinkler	207	34.51	25.00	5.6	37.973		
Sprinkler	208	33.24	10.00	5.6	35.228		
Sprinkler	209	33.74	10.00	5.6	36.291		

Most Demanding Sprinkler Data

Node Analysis

Job Number: 11-137
Report Description: Light Hazard (Attic Dry Calcs)

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)	
2	-3'-0	S	70.615	323.43	
201	23'-10	Spr(-22.009)	22.009	38.00	
202	23'-10	Spr(-22.085)	22.085	38.07	
203	23'-10	Spr(-22.361)	22.361	38.30	
204	23'-10	Spr(-22.949)	22.949	38.80	
205	20'-5½	Spr(-37.676)	37.676	34.37	
206	20'-5¼	Spr(-37.742)	37.742	34.40	
207	20'-5¼	Spr(-37.973)	37.973	34.51	
208	14'-11¾	Spr(-35.228)	35.228	33.24	
209	14'-11½	Spr(-36.291)	36.291	33.74	
1	-0'-10¼		0.000		
4	-0'-6		0.000		
5	0'-0		67.299		
7	-0'-6		0.000		
29	12'-8½	T(20'-2)	55.813		
32	3'-1	BFP(-5.000)	65.860		
199	12'-9	PO(12'-3¾)	48.548		
200	20'-3¾	LtE(3'-8¼)	41.937		
388	12'-9¾	PO(12'-3¾)	47.714		
389	20'-3¾	LtE(3'-8¼)	42.883		
405	20'-5½	PO(12'-3¾)	37.672		
531	12'-10½	PO(6'-0)	47.170		
532	12'-10¾	PO(6'-0)	46.796		
534	12'-11¼	PO(6'-0)	46.243		
536	12'-11¾	PO(6'-0)	45.739		
539	13'-0¼	PO(6'-0)	45.204		
542	12'-11½	PO(6'-0)	47.418		
544	12'-11	PO(6'-0)	47.435		
546	12'-10½	PO(6'-0)	47.464		
569	12'-10¼	PO(20'-2)	47.614		
570	13'-11¼	E(3'-0)	44.841		
571	13'-11¼	E(3'-0)	45.326		
573	13'-11¼	E(3'-0)	45.813		
574	13'-11¼	E(3'-0)	46.990		
575	13'-11¼	E(3'-0)	46.400		
576	13'-11	E(3'-0)	46.957		
578	13'-11	E(3'-0)	46.702		
587	14'-11¼	T(6'-0)	40.066		
629	10'-2¾	T(6'-0)	48.269		
647	13'-0¼	PO(6'-0)	45.204		
653	13'-11¼	E(3'-0)	46.992		
665	9'-2¾	E(2'-0)	49.023		
668	9'-2¾	T(5'-0)	49.006		
671	9'-2¾	T(3'-6¾)	48.680		
674	9'-2¾	T(6'-0)	47.843		
677	9'-2¾	T(6'-0)	47.372		
680	9'-2¾	E(3'-0)	47.023		
687	10'-2¾	T(6'-0)	48.264		

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary	
• • • • • Route 1 • • • • •									
CM	2.1570	38.00	3.34	120		0.012747	6'-0	Pf	0.076
201	23'-10	38.00	8.1	22.009		Sprinkler		Pe	
202	23'-10			22.085			6'-0	Pv	
CM	2.1570	76.07	6.68	120		0.046026	6'-0	Pf	0.276
202	23'-10	38.07	8.1	22.085		Sprinkler		Pe	
203	23'-10			22.361			6'-0	Pv	
CM	2.1570	114.37	10.04	120		0.097876	6'-0	Pf	0.587
203	23'-10	38.30	8.1	22.361		Sprinkler		Pe	
204	23'-10			22.949			6'-0	Pv	
CM	2.1570	153.17	13.45	120		0.168029	87'-10¾	Pf	17.457
204	23'-10	38.80	8.1	22.949		Sprinkler,	16'-0	Pe	1.532
200	20'-3¾			41.937		2E(6'-1¾), LtE(3'-8¼)	103'-10¾	Pv	
FR	2.1570	153.17	13.45	120		0.168029	7'-6½	Pf	3.337
200	20'-3¾			41.937			12'-3¾	Pe	3.274
199	12'-9			48.548		PO(12'-3¾)	19'-10¼	Pv	
CM	3.2600	323.43	12.43	120		0.089614	47'-2¼	Pf	7.239
199	12'-9	170.26		48.548		Flow (q) from Route 2	33'-7¼	Pe	0.026
29	12'-8½			55.813		2LtE(6'-8¾), T(20'-2)	80'-9½	Pv	
FR	4.2600	323.43	7.28	100		0.034120	6'-3¼	Pf	5.879
29	12'-8½			55.813			19'-5¾	Pe	4.169
32	3'-1			65.860		DPV(8'-2½), BV(11'-3¼), BFP(-5.000)	25'-9	Pv	
FR	4.2600	323.43	7.28	100		0.034120	3'-1	Pf	0.105
32	3'-1			65.860				Pe	1.333
5	0'-0			67.299			3'-1	Pv	
UG	4.2200	323.43	7.42	140		0.019170	88'-3	Pf	2.013
5	0'-0			67.299		Supply,	16'-8¾	Pe	1.304
2	-3'-0			70.615		E(16'-8¾), S	104'-11¾	Pv	
		100.00				Hose Allowance At Source			
2		423.43							
• • • • • Route 2 • • • • •									
CM	2.1570	33.68	2.96	120		0.010197	6'-0	Pf	0.061
205	20'-5½	34.37	5.6	37.676		Sprinkler		Pe	0.006
206	20'-5¼			37.742			6'-0	Pv	
CM	2.1570	68.08	5.98	120		0.037493	6'-0	Pf	0.225
206	20'-5¼	34.40	5.6	37.742		Sprinkler		Pe	0.006
207	20'-5¼			37.973			6'-0	Pv	
CM	2.1570	102.59	9.01	120		0.080052	57'-0	Pf	4.859
207	20'-5¼	34.51	5.6	37.973		Sprinkler,	3'-8¼	Pe	0.052
389	20'-3¾			42.883		LtE(3'-8¼)	60'-8¼	Pv	
FR	2.1570	102.59	9.01	120		0.080052	7'-5¾	Pf	1.585
389	20'-3¾			42.883			12'-3¾	Pe	3.246
388	12'-9¾			47.714		PO(12'-3¾)	19'-9½	Pv	
CM	3.2600	170.26	6.54	120		0.027342	29'-6	Pf	0.806
388	12'-9¾	67.67		47.714		Flow (q) from Route 3		Pe	0.027
199	12'-9			48.548			29'-6	Pv	
• • • • • Route 3 • • • • •									
CM	2.1570	0.69	0.06	120		0.000008	4'-2¼	Pf	0.000
205	20'-5½	34.37	5.6	37.676		Sprinkler,	12'-3¾	Pe	-0.004
405	20'-5½			37.672		PO(12'-3¾)	16'-6	Pv	
CM	1.3800	0.69	0.15	120		0.000068	15'-2	Pf	0.001
405	20'-5½			37.672				Pe	2.393
587	14'-11¼			40.066			15'-2	Pv	
CM	1.3800	67.67	14.51	120		0.326299	4'-2¼	Pf	4.301
587	14'-11¼	66.97		40.066		Flow (q) from Route 4	9'-0	Pe	0.838
647	13'-0¼			45.204		E(3'-0), PO(6'-0)	13'-2¼	Pv	
CM	2.1570	7.14	0.63	120		0.000578	0'-9¾	Pf	0.000
647	13'-0¼			45.204				Pe	-0.001
539	13'-0¼			45.204			0'-9¾	Pv	
RN	1.3800	7.14	1.53	120		0.005089	0'-11½	Pf	0.035
539	13'-0¼			45.204		PO(6'-0)	6'-0	Pe	-0.399
570	13'-11¼			44.841			6'-11½	Pv	
BL	1.3800	7.14	1.53	120		0.005089	16'-7	Pf	0.145
570	13'-11¼			44.841		E(3'-0)	12'-0	Pe	2.037
680	9'-2¾			47.023		3E(3'-0)	28'-7	Pv	
BL	1.0490	7.14	2.65	120		0.019348	18'-0	Pf	0.348
680	9'-2¾			47.023				Pe	0.000
677	9'-2¾			47.372			18'-0	Pv	
BL	1.0490	8.67	3.22	120		0.027719	17'-0	Pf	0.471
677	9'-2¾	1.53		47.372		Flow (q) from Route 13		Pe	-0.000
674	9'-2¾			47.843			17'-0	Pv	

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary	
BL	1.3800	1.12	0.24	120		0.000165	16'-6¾	Pf	0.005
674	9'-2¾			47.843		T(6'-0)	15'-0	Pe	-2.036
573	13'-11¼			45.813		3E(3'-0)	31'-6¾	Pv	
RN	1.3800	1.12	0.24	120		0.000165	1'-0¼	Pf	0.001
573	13'-11¼			45.813			6'-0	Pe	0.429
534	12'-11¼			46.243		PO(6'-0)	7'-0¼	Pv	
CM	2.1570	60.11	5.28	120		0.029779	18'-0	Pf	0.536
534	12'-11¼	59.00		46.243		Flow (q) from Route 5		Pe	0.017
532	12'-10¾			46.796			18'-0	Pv	
CM	2.1570	51.66	4.54	120		0.022497	16'-0	Pf	0.360
532	12'-10¾			46.796				Pe	0.015
531	12'-10½			47.170			16'-0	Pv	
CM	2.1570	55.11	4.84	120		0.025353	5'-0	Pf	0.439
531	12'-10½	3.45		47.170		Flow (q) from Route 6	12'-3¾	Pe	0.005
569	12'-10¼			47.614		PO(12'-3¾)	17'-3¾	Pv	
CM	3.2600	67.67	2.60	120		0.004960	17'-1¼	Pf	0.085
569	12'-10¼	12.56		47.614		Flow (q) from Route 7		Pe	0.016
388	12'-9¾			47.714			17'-1¼	Pv	
• • • • • Route 4 • • • • •									
CM	1.3800	33.24	7.13	120		0.087591	12'-0	Pf	1.051
208	14'-11¾	33.24	5.6	35.228		Sprinkler		Pe	0.012
209	14'-11½			36.291			12'-0	Pv	
CM	1.3800	66.97	14.37	120		0.320156	5'-9¼	Pf	3.769
209	14'-11½	33.74	5.6	36.291		Sprinkler,	6'-0	Pe	0.006
587	14'-11¼			40.066		T(6'-0)	11'-9¼	Pv	
• • • • • Route 5 • • • • •									
CM	2.1570	60.53	5.31	120		0.030158	17'-2¼	Pf	0.518
647	13'-0¼			45.204				Pe	0.016
536	12'-11¾			45.739			17'-2¼	Pv	
CM	2.1570	59.00	5.18	120		0.028762	17'-0	Pf	0.489
536	12'-11¾			45.739				Pe	0.016
534	12'-11¼			46.243			17'-0	Pv	
• • • • • Route 6 • • • • •									
BL	1.3800	3.83	0.82	120		0.001608	2'-0	Pf	0.018
671	9'-2¾			48.680			9'-0	Pe	-0.434
687	10'-2¾			48.264		E(3'-0), T(6'-0)	11'-0	Pv	
BL	1.3800	12.28	2.63	120		0.013889	0'-4	Pf	0.005
687	10'-2¾	8.45		48.264		Flow (q) from Route 8		Pe	
629	10'-2¾			48.269			0'-4	Pv	
BL	1.3800	3.45	0.74	120		0.001323	16'-2¼	Pf	0.033
629	10'-2¾			48.269		T(6'-0)	9'-0	Pe	-1.600
578	13'-11			46.702		E(3'-0)	25'-2¼	Pv	
RN	1.3800	3.45	0.74	120		0.001323	1'-1	Pf	0.009
578	13'-11			46.702			6'-0	Pe	0.459
531	12'-10½			47.170		PO(6'-0)	7'-1	Pv	
• • • • • Route 7 • • • • •									
BL	1.0490	3.72	1.38	100		0.008127	33'-0	Pf	0.326
671	9'-2¾			48.680		T(3'-6¾)	7'-1½	Pe	-0.000
668	9'-2¾			49.006		T(3'-6¾)	40'-1½	Pv	
BL	1.3800	2.52	0.54	120		0.000742	16'-6¾	Pf	0.019
668	9'-2¾			49.006			9'-0	Pe	-2.035
574	13'-11¼			46.990		3E(3'-0)	25'-6¾	Pv	
RN	1.3800	2.52	0.54	120		0.000742	1'-0½	Pf	0.005
574	13'-11¼			46.990			6'-0	Pe	0.439
544	12'-11			47.435		PO(6'-0)	7'-0½	Pv	
CM	1.6820	3.72	0.54	100		0.000815	17'-0	Pf	0.014
544	12'-11	1.20		47.435		Flow (q) from Route 10		Pe	0.016
546	12'-10½			47.464			17'-0	Pv	
CM	1.6820	12.56	1.81	100		0.007734	11'-0	Pf	0.140
546	12'-10½	8.84		47.464		Flow (q) from Route 9	7'-0¾	Pe	0.010
569	12'-10¼			47.614		PO(7'-0¾)	18'-0¾	Pv	
• • • • • Route 8 • • • • •									
BL	1.3800	8.45	1.81	120		0.006959	31'-10½	Pf	0.263
575	13'-11¼			46.400		E(3'-0)	6'-0	Pe	1.601
687	10'-2¾			48.264		E(3'-0)	37'-10½	Pv	
• • • • • Route 9 • • • • •									
RN	1.3800	8.84	1.90	120		0.007552	1'-1	Pf	0.053
576	13'-11			46.957			6'-0	Pe	0.454
546	12'-10½			47.464		PO(6'-0)	7'-1	Pv	
• • • • • Route 10 • • • • •									
CM	1.6820	1.20	0.17	100		0.000101	16'-0	Pf	0.002
542	12'-11½	1.20		47.418		Flow (q) from Route 12		Pe	0.015
544	12'-11			47.435			16'-0	Pv	

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary	
• • • • • Route 11 • • • • •									
BL	1.0490	7.55	2.80	120		0.021469	34'-0	Pf	0.837
674	9'-2¾			47.843			5'-0	Pe	0.000
671	9'-2¾			48.680		T(5'-0)	39'-0	Pv	
• • • • • Route 12 • • • • •									
BL	1.0490	1.20	0.45	120		0.000715	16'-0	Pf	0.016
668	9'-2¾			49.006		T(5'-0)	7'-0	Pe	-0.000
665	9'-2¾			49.023		E(2'-0)	23'-0	Pv	
BL	1.3800	1.20	0.26	120		0.000188	16'-6¾	Pf	0.005
665	9'-2¾			49.023			9'-0	Pe	-2.036
653	13'-11¼			46.992		3E(3'-0)	25'-6¾	Pv	
RN	1.3800	1.20	0.26	120		0.000188	1'-0¼	Pf	0.001
653	13'-11¼			46.992			6'-0	Pe	0.425
542	12'-11½			47.418		PO(6'-0)	7'-0¼	Pv	
• • • • • Route 13 • • • • •									
RN	1.3800	1.53	0.33	120		0.000295	0'-11¾	Pf	0.002
536	12'-11¾			45.739		PO(6'-0)	6'-0	Pe	-0.415
571	13'-11¼			45.326			6'-11¾	Pv	
BL	1.3800	1.53	0.33	120		0.000295	16'-7	Pf	0.009
571	13'-11¼			45.326		E(3'-0)	15'-0	Pe	2.036
677	9'-2¾			47.372		2E(3'-0), T(6'-0)	31'-7	Pv	
• • • • • Route 14 • • • • •									
BL	1.3800	8.84	1.90	120		0.007552	32'-2¼	Pf	0.288
629	10'-2¾			48.269			6'-0	Pe	-1.600
576	13'-11			46.957		2E(3'-0)	38'-2¼	Pv	
• • • • • Route 15 • • • • •									
RN	1.3800	8.45	1.81	120		0.006959	1'-0¾	Pf	0.049
532	12'-10¾			46.796		PO(6'-0)	6'-0	Pe	-0.445
575	13'-11¼			46.400			7'-0¾	Pv	

Equivalent Pipe Lengths of Valves and Fittings (C=120 only)

$$\left(\frac{\text{Actual Inside Diameter}}{\text{Schedule 40 Steel Pipe Inside Diameter}}\right)^{4.87} = \text{Factor}$$

C Value Multiplier

Value Of C	100	130	140	150
Multiplying Factor	0.713	1.16	1.33	1.51

Pipe Type	Diameter	Flow	Velocity	HWC		Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Fittings	Eq. Length	Summary
Upstream							Total Length	

Pipe Type Legend

AO	Arm-Over
BL	Branch Line
CM	Cross Main
DN	Drain
DR	Drop
DY	Dynamic
FM	Feed Main
FR	Feed Riser
MS	Miscellaneous
OR	Outrigger
RN	Riser Nipple
SP	Sprig
ST	Stand Pipe
UG	Underground

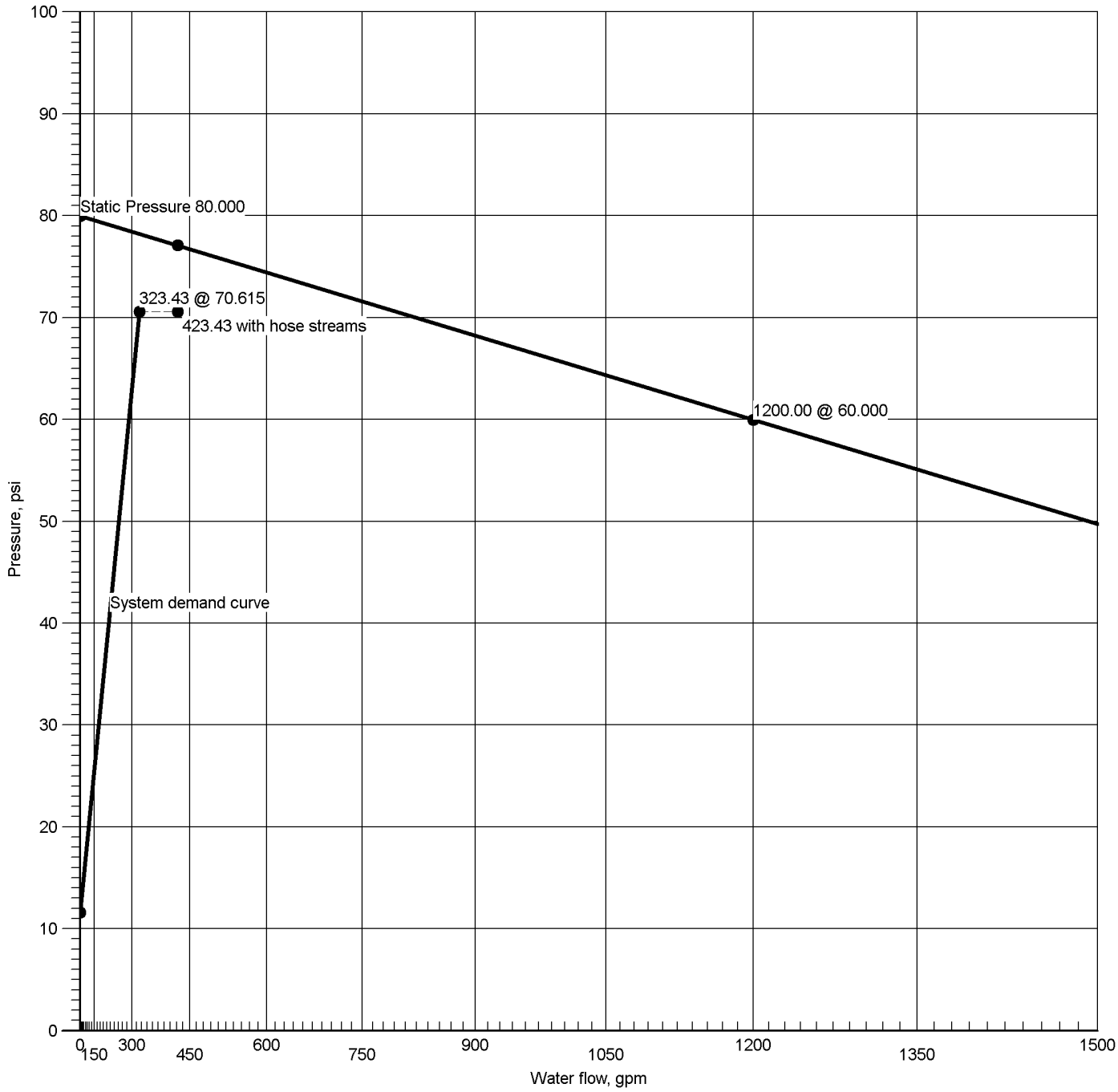
Units Legend

Diameter	Inch
Elevation	Foot
Flow	gpm
Discharge	gpm
Velocity	fps
Pressure	psi
Length	Foot
Friction Loss	psi/Foot
HWC	Hazen-Williams Constant
Pt	Total pressure at a point in a pipe
Pn	Normal pressure at a point in a pipe
Pf	Pressure loss due to friction between points
Pe	Pressure due to elevation difference between indicated points
Pv	Velocity pressure at a point in a pipe

Fittings Legend

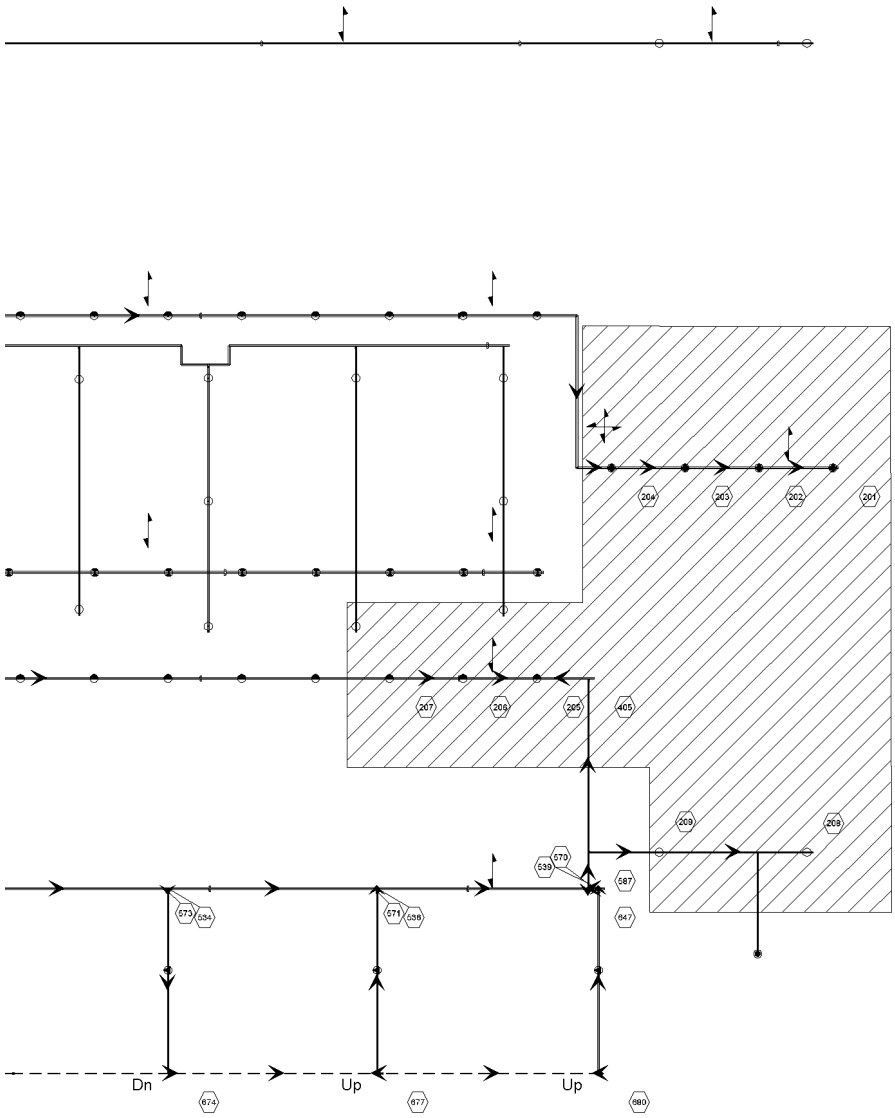
ALV	Alarm Valve
AngV	Angle Valve
b	Bushing
BalV	Ball Valve
BFP	Backflow Preventer
BV	Butterfly Valve
C	Cross Flow Turn 90°
cplg	Coupling
Cr	Cross Run
CV	Check Valve
DelV	Deluge Valve
DPV	Dry Pipe Valve
E	90° Elbow
EE	45° Elbow
Ee1	11¼° Elbow
Ee2	22½° Elbow
f	Flow Device
fd	Flex Drop
FDC	Fire Department Connection
fE	90° FireLock(TM) Elbow
fEE	45° FireLock(TM) Elbow
flg	Flange
FN	Floating Node
fT	FireLock(TM) Tee
g	Gauge
GloV	Globe Valve
GV	Gate Valve
Ho	Hose
Hose	Hose
HV	Hose Valve
Hyd	Hydrant
LtE	Long Turn Elbow
mecT	Mechanical Tee
Noz	Nozzle
P1	Pump In
P2	Pump Out
PIV	Post Indicating Valve
PO	Pipe Outlet
PRV	Pressure Reducing Valve
PrV	Pressure Relief Valve
red	Reducer/Adapter
S	Supply
sCV	Swing Check Valve
Spr	Sprinkler
St	Strainer
T	Tee Flow Turn 90°
Tr	Tee Run
U	Union
WirF	Wirsbo
WMV	Water Meter Valve
Z	Cap

Supply at Node 2



Hydraulic Graph	Supply at Node 2
Static: Pressure	80.000
Residual: Pressure	60.000 @ 1200.00
Available Pressure at Time of Test	77.089 @ 423.43
System Demand	70.615 @ 323.43
System Demand (Including Hose Allowance at Source)	70.615 @ 423.43

Flow Diagram (Current View)



ATTIC SPRNKS

Hydraulic Overview

Job Number: 11-137
Report Description: Light Hazard (Attic Dry Calcs)

Job

Job Number: 11-137	Design Engineer: Franklin Callfas
Job Name: Wallowa Medical Hospital	Phone: (541) 848-1798 FAX
Address 1: Wallowa County Health Care District	State Certification/License Number
Address 2: Enterprise, Oregon, 97828	AHJ
Address 3	Job Site/Building

System

Density: 0.100gpm/ft²	Area of Application: 1500.00ft² (Actual 1387.30ft²)
Most Demanding Sprinkler Data: 8.1 K-Factor 38.00 at 22.009	Hose Streams: 100.00
Coverage Per Sprinkler: 100.00ft²	Number Of Sprinklers Calculated: 9
System Pressure Demand: 70.615	System Flow Demand: 323.43
Total Demand: 423.43 @ 70.615	Pressure Result: 16.473 (8.4%)

Supplies

Node	Flow(gpm)	Hose Flow(gpm)	Static(psi)	Residual(psi)
2	1200.00	100.00	80.000	60.000

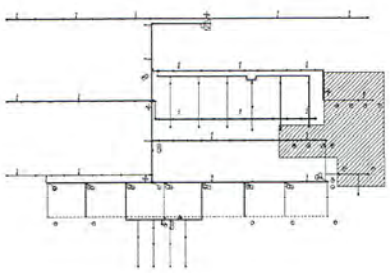
Check Point Gauges

Identifier	Pressure(psi)	K-Factor(K)	Flow(gpm)

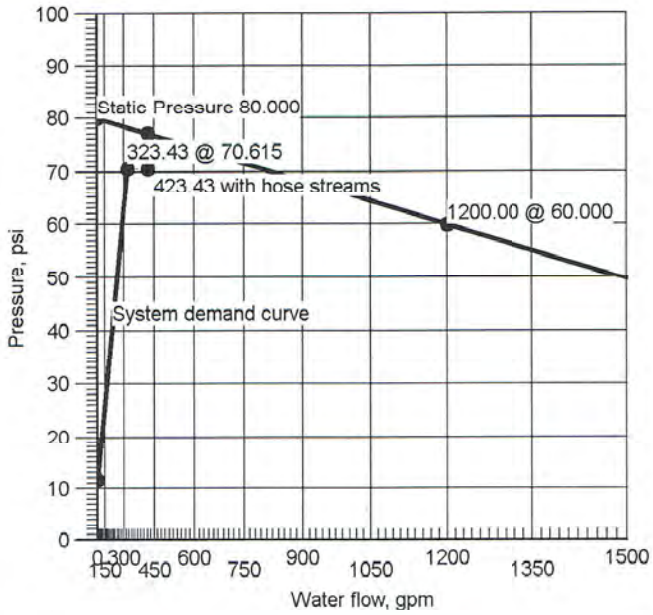
REGISTERED PROFESSIONAL ENGINEER 84637PE OREGON Nov. 19 2110 FRANKLIN D. CALLFAS

Expires 12-31-11

Wallowa Rev-0a



Supply at Node 2 (1200.00, 100.00, 80.000, 60.000)



Hydraulic Summary

Job

Job Number: 11-137	Design Engineer: Franklin Callfas
Job Name: Wallowa Medical Hospital	State Certification/License Number:
Address 1: Wallowa County Health Care District	AHJ:
Address 2: Enterprise, Oregon, 97828	Job Site/Building:
Address 3:	Drawing Name: Wallowa Rev-0a

System

Most Demanding Sprinkler Data: 8.1 K-Factor 38.00 at 22.009	
Hose Allowance At Source: 100.00	
Additional Hose Supplies: Node / Flow(gpm)	
Total Hose Streams: 100.00	
System Flow Demand: 323.43	Total Water Required (Including Hose Allowance): 423.43
Maximum Pressure Unbalance In Loops: 0.000	
Maximum Velocity Above Ground: 14.51 between nodes 647 and 587	
Maximum Velocity Under Ground: 7.42 between nodes 2 and 5	
Volume capacity of Wet Pipes: 89.79gal	Volume capacity of Dry Pipes: 388.01gal

Remote Area(s)

Occupancy: Light Hazard (Attic Dry Calcs)	Job Suffix:
Density: 0.100gpm/ft²	Area of Application: 1500.00ft² (Actual 1387.30ft²)
Number Of Sprinklers Calculated: 9	Coverage Per Sprinkler: 100.00ft²
AutoPeak Results: Pressure For Remote Area(s) Adjacent To Most Remote Area	

Supplies

Node	Hose Flow (gpm)	Static (psi)	Residual (psi)	@	Flow (gpm)	Available (psi)	@	Total Demand (gpm)	Required (psi)	Safety Margin (psi)
2	100.00	80.000	60.000		1200.00	77.089		423.43	70.615	6.473

Contractor

	Contractor Number	Contact Name	Contact Title
Name of Contractor:		Phone	Extension
Address 1		FAX	
Address 2		E-mail	
Address 3		Web-Site	

Summary Of Outflowing Devices

Job Number: 11-137
Report Description: Light Hazard (Attic Dry Calcs)

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)		
Sprinkler	**201**	**38.00**	**38.00**	**8.1**	**22.009**		
Sprinkler	202	38.07	38.00	8.1	22.085		
Sprinkler	203	38.30	38.00	8.1	22.361		
Sprinkler	204	38.80	38.00	8.1	22.949		
Sprinkler	205	34.37	25.00	5.6	37.676		
Sprinkler	206	34.40	25.00	5.6	37.742		
Sprinkler	207	34.51	25.00	5.6	37.973		
Sprinkler	208	33.24	10.00	5.6	35.228		
Sprinkler	209	33.74	10.00	5.6	36.291		

Most Demanding Sprinkler Data

Node Analysis

Job Number: 11-137
Report Description: Light Hazard (Attic Dry Calcs)

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)	
2	-3'-0	S	70.615	323.43	
201	23'-10	Spr(-22.009)	22.009	38.00	
202	23'-10	Spr(-22.085)	22.085	38.07	
203	23'-10	Spr(-22.361)	22.361	38.30	
204	23'-10	Spr(-22.949)	22.949	38.80	
205	20'-5½	Spr(-37.676)	37.676	34.37	
206	20'-5¼	Spr(-37.742)	37.742	34.40	
207	20'-5¼	Spr(-37.973)	37.973	34.51	
208	14'-11¾	Spr(-35.228)	35.228	33.24	
209	14'-11½	Spr(-36.291)	36.291	33.74	
1	-0'-10¼		0.000		
4	-0'-6		0.000		
5	0'-0		67.299		
7	-0'-6		0.000		
29	12'-8½	T(20'-2)	55.813		
32	3'-1	BFP(-5.000)	65.860		
199	12'-9	PO(12'-3¾)	48.548		
200	20'-3¾	LtE(3'-8¼)	41.937		
388	12'-9¾	PO(12'-3¾)	47.714		
389	20'-3¾	LtE(3'-8¼)	42.883		
405	20'-5½	PO(12'-3¾)	37.672		
531	12'-10½	PO(6'-0)	47.170		
532	12'-10¾	PO(6'-0)	46.796		
534	12'-11¼	PO(6'-0)	46.243		
536	12'-11¾	PO(6'-0)	45.739		
539	13'-0¼	PO(6'-0)	45.204		
542	12'-11½	PO(6'-0)	47.418		
544	12'-11	PO(6'-0)	47.435		
546	12'-10½	PO(6'-0)	47.464		
569	12'-10¼	PO(20'-2)	47.614		
570	13'-11¼	E(3'-0)	44.841		
571	13'-11¼	E(3'-0)	45.326		
573	13'-11¼	E(3'-0)	45.813		
574	13'-11¼	E(3'-0)	46.990		
575	13'-11¼	E(3'-0)	46.400		
576	13'-11	E(3'-0)	46.957		
578	13'-11	E(3'-0)	46.702		
587	14'-11¼	T(6'-0)	40.066		
629	10'-2¾	T(6'-0)	48.269		
647	13'-0¼	PO(6'-0)	45.204		
653	13'-11¼	E(3'-0)	46.992		
665	9'-2¾	E(2'-0)	49.023		
668	9'-2¾	T(5'-0)	49.006		
671	9'-2¾	T(3'-6¾)	48.680		
674	9'-2¾	T(6'-0)	47.843		
677	9'-2¾	T(6'-0)	47.372		
680	9'-2¾	E(3'-0)	47.023		
687	10'-2¾	T(6'-0)	48.264		

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary	
• • • • • Route 1 • • • • •									
CM	2.1570	38.00	3.34	120		0.012747	6'-0	Pf	0.076
201	23'-10	38.00	8.1	22.009		Sprinkler		Pe	
202	23'-10			22.085			6'-0	Pv	
CM	2.1570	76.07	6.68	120		0.046026	6'-0	Pf	0.276
202	23'-10	38.07	8.1	22.085		Sprinkler		Pe	
203	23'-10			22.361			6'-0	Pv	
CM	2.1570	114.37	10.04	120		0.097876	6'-0	Pf	0.587
203	23'-10	38.30	8.1	22.361		Sprinkler		Pe	
204	23'-10			22.949			6'-0	Pv	
CM	2.1570	153.17	13.45	120		0.168029	87'-10¾	Pf	17.457
204	23'-10	38.80	8.1	22.949		Sprinkler,	16'-0	Pe	1.532
200	20'-3¾			41.937		2E(6'-1¾), LtE(3'-8¼)	103'-10¾	Pv	
FR	2.1570	153.17	13.45	120		0.168029	7'-6½	Pf	3.337
200	20'-3¾			41.937			12'-3¾	Pe	3.274
199	12'-9			48.548		PO(12'-3¾)	19'-10¼	Pv	
CM	3.2600	323.43	12.43	120		0.089614	47'-2¼	Pf	7.239
199	12'-9	170.26		48.548		Flow (q) from Route 2	33'-7¼	Pe	0.026
29	12'-8½			55.813		2LtE(6'-8¾), T(20'-2)	80'-9½	Pv	
FR	4.2600	323.43	7.28	100		0.034120	6'-3¼	Pf	5.879
29	12'-8½			55.813			19'-5¾	Pe	4.169
32	3'-1			65.860		DPV(8'-2½), BV(11'-3¼), BFP(-5.000)	25'-9	Pv	
FR	4.2600	323.43	7.28	100		0.034120	3'-1	Pf	0.105
32	3'-1			65.860				Pe	1.333
5	0'-0			67.299			3'-1	Pv	
UG	4.2200	323.43	7.42	140		0.019170	88'-3	Pf	2.013
5	0'-0			67.299		Supply,	16'-8¾	Pe	1.304
2	-3'-0			70.615		E(16'-8¾), S	104'-11¾	Pv	
		100.00				Hose Allowance At Source			
2		423.43							
• • • • • Route 2 • • • • •									
CM	2.1570	33.68	2.96	120		0.010197	6'-0	Pf	0.061
205	20'-5½	34.37	5.6	37.676		Sprinkler		Pe	0.006
206	20'-5¼			37.742			6'-0	Pv	
CM	2.1570	68.08	5.98	120		0.037493	6'-0	Pf	0.225
206	20'-5¼	34.40	5.6	37.742		Sprinkler		Pe	0.006
207	20'-5¼			37.973			6'-0	Pv	
CM	2.1570	102.59	9.01	120		0.080052	57'-0	Pf	4.859
207	20'-5¼	34.51	5.6	37.973		Sprinkler,	3'-8¼	Pe	0.052
389	20'-3¾			42.883		LtE(3'-8¼)	60'-8¼	Pv	
FR	2.1570	102.59	9.01	120		0.080052	7'-5¾	Pf	1.585
389	20'-3¾			42.883			12'-3¾	Pe	3.246
388	12'-9¾			47.714		PO(12'-3¾)	19'-9½	Pv	
CM	3.2600	170.26	6.54	120		0.027342	29'-6	Pf	0.806
388	12'-9¾	67.67		47.714		Flow (q) from Route 3		Pe	0.027
199	12'-9			48.548			29'-6	Pv	
• • • • • Route 3 • • • • •									
CM	2.1570	0.69	0.06	120		0.000008	4'-2¼	Pf	0.000
205	20'-5½	34.37	5.6	37.676		Sprinkler,	12'-3¾	Pe	-0.004
405	20'-5½			37.672		PO(12'-3¾)	16'-6	Pv	
CM	1.3800	0.69	0.15	120		0.000068	15'-2	Pf	0.001
405	20'-5½			37.672				Pe	2.393
587	14'-11¼			40.066			15'-2	Pv	
CM	1.3800	67.67	14.51	120		0.326299	4'-2¼	Pf	4.301
587	14'-11¼	66.97		40.066		Flow (q) from Route 4	9'-0	Pe	0.838
647	13'-0¼			45.204		E(3'-0), PO(6'-0)	13'-2¼	Pv	
CM	2.1570	7.14	0.63	120		0.000578	0'-9¾	Pf	0.000
647	13'-0¼			45.204				Pe	-0.001
539	13'-0¼			45.204			0'-9¾	Pv	
RN	1.3800	7.14	1.53	120		0.005089	0'-11½	Pf	0.035
539	13'-0¼			45.204		PO(6'-0)	6'-0	Pe	-0.399
570	13'-11¼			44.841			6'-11½	Pv	
BL	1.3800	7.14	1.53	120		0.005089	16'-7	Pf	0.145
570	13'-11¼			44.841		E(3'-0)	12'-0	Pe	2.037
680	9'-2¾			47.023		3E(3'-0)	28'-7	Pv	
BL	1.0490	7.14	2.65	120		0.019348	18'-0	Pf	0.348
680	9'-2¾			47.023				Pe	0.000
677	9'-2¾			47.372			18'-0	Pv	
BL	1.0490	8.67	3.22	120		0.027719	17'-0	Pf	0.471
677	9'-2¾	1.53		47.372		Flow (q) from Route 13		Pe	-0.000
674	9'-2¾			47.843			17'-0	Pv	

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary	
BL	1.3800	1.12	0.24	120		0.000165	16'-6¾	Pf	0.005
674	9'-2¾			47.843		T(6'-0)	15'-0	Pe	-2.036
573	13'-11¼			45.813		3E(3'-0)	31'-6¾	Pv	
RN	1.3800	1.12	0.24	120		0.000165	1'-0¼	Pf	0.001
573	13'-11¼			45.813			6'-0	Pe	0.429
534	12'-11¼			46.243		PO(6'-0)	7'-0¼	Pv	
CM	2.1570	60.11	5.28	120		0.029779	18'-0	Pf	0.536
534	12'-11¼	59.00		46.243		Flow (q) from Route 5		Pe	0.017
532	12'-10¾			46.796			18'-0	Pv	
CM	2.1570	51.66	4.54	120		0.022497	16'-0	Pf	0.360
532	12'-10¾			46.796				Pe	0.015
531	12'-10½			47.170			16'-0	Pv	
CM	2.1570	55.11	4.84	120		0.025353	5'-0	Pf	0.439
531	12'-10½	3.45		47.170		Flow (q) from Route 6	12'-3¾	Pe	0.005
569	12'-10¼			47.614		PO(12'-3¾)	17'-3¾	Pv	
CM	3.2600	67.67	2.60	120		0.004960	17'-1¼	Pf	0.085
569	12'-10¼	12.56		47.614		Flow (q) from Route 7		Pe	0.016
388	12'-9¾			47.714			17'-1¼	Pv	
• • • • • Route 4 • • • • •									
CM	1.3800	33.24	7.13	120		0.087591	12'-0	Pf	1.051
208	14'-11¾	33.24	5.6	35.228		Sprinkler		Pe	0.012
209	14'-11½			36.291			12'-0	Pv	
CM	1.3800	66.97	14.37	120		0.320156	5'-9¼	Pf	3.769
209	14'-11½	33.74	5.6	36.291		Sprinkler,	6'-0	Pe	0.006
587	14'-11¼			40.066		T(6'-0)	11'-9¼	Pv	
• • • • • Route 5 • • • • •									
CM	2.1570	60.53	5.31	120		0.030158	17'-2¼	Pf	0.518
647	13'-0¼			45.204				Pe	0.016
536	12'-11¾			45.739			17'-2¼	Pv	
CM	2.1570	59.00	5.18	120		0.028762	17'-0	Pf	0.489
536	12'-11¾			45.739				Pe	0.016
534	12'-11¼			46.243			17'-0	Pv	
• • • • • Route 6 • • • • •									
BL	1.3800	3.83	0.82	120		0.001608	2'-0	Pf	0.018
671	9'-2¾			48.680			9'-0	Pe	-0.434
687	10'-2¾			48.264		E(3'-0), T(6'-0)	11'-0	Pv	
BL	1.3800	12.28	2.63	120		0.013889	0'-4	Pf	0.005
687	10'-2¾	8.45		48.264		Flow (q) from Route 8		Pe	
629	10'-2¾			48.269			0'-4	Pv	
BL	1.3800	3.45	0.74	120		0.001323	16'-2¼	Pf	0.033
629	10'-2¾			48.269		T(6'-0)	9'-0	Pe	-1.600
578	13'-11			46.702		E(3'-0)	25'-2¼	Pv	
RN	1.3800	3.45	0.74	120		0.001323	1'-1	Pf	0.009
578	13'-11			46.702			6'-0	Pe	0.459
531	12'-10½			47.170		PO(6'-0)	7'-1	Pv	
• • • • • Route 7 • • • • •									
BL	1.0490	3.72	1.38	100		0.008127	33'-0	Pf	0.326
671	9'-2¾			48.680		T(3'-6¾)	7'-1½	Pe	-0.000
668	9'-2¾			49.006		T(3'-6¾)	40'-1½	Pv	
BL	1.3800	2.52	0.54	120		0.000742	16'-6¾	Pf	0.019
668	9'-2¾			49.006			9'-0	Pe	-2.035
574	13'-11¼			46.990		3E(3'-0)	25'-6¾	Pv	
RN	1.3800	2.52	0.54	120		0.000742	1'-0½	Pf	0.005
574	13'-11¼			46.990			6'-0	Pe	0.439
544	12'-11			47.435		PO(6'-0)	7'-0½	Pv	
CM	1.6820	3.72	0.54	100		0.000815	17'-0	Pf	0.014
544	12'-11	1.20		47.435		Flow (q) from Route 10		Pe	0.016
546	12'-10½			47.464			17'-0	Pv	
CM	1.6820	12.56	1.81	100		0.007734	11'-0	Pf	0.140
546	12'-10½	8.84		47.464		Flow (q) from Route 9	7'-0¾	Pe	0.010
569	12'-10¼			47.614		PO(7'-0¾)	18'-0¾	Pv	
• • • • • Route 8 • • • • •									
BL	1.3800	8.45	1.81	120		0.006959	31'-10½	Pf	0.263
575	13'-11¼			46.400		E(3'-0)	6'-0	Pe	1.601
687	10'-2¾			48.264		E(3'-0)	37'-10½	Pv	
• • • • • Route 9 • • • • •									
RN	1.3800	8.84	1.90	120		0.007552	1'-1	Pf	0.053
576	13'-11			46.957			6'-0	Pe	0.454
546	12'-10½			47.464		PO(6'-0)	7'-1	Pv	
• • • • • Route 10 • • • • •									
CM	1.6820	1.20	0.17	100		0.000101	16'-0	Pf	0.002
542	12'-11½	1.20		47.418		Flow (q) from Route 12		Pe	0.015
544	12'-11			47.435			16'-0	Pv	

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary	
• • • • • Route 11 • • • • •									
BL	1.0490	7.55	2.80	120		0.021469	34'-0	Pf	0.837
674	9'-2¾			47.843			5'-0	Pe	0.000
671	9'-2¾			48.680		T(5'-0)	39'-0	Pv	
• • • • • Route 12 • • • • •									
BL	1.0490	1.20	0.45	120		0.000715	16'-0	Pf	0.016
668	9'-2¾			49.006		T(5'-0)	7'-0	Pe	-0.000
665	9'-2¾			49.023		E(2'-0)	23'-0	Pv	
BL	1.3800	1.20	0.26	120		0.000188	16'-6¾	Pf	0.005
665	9'-2¾			49.023			9'-0	Pe	-2.036
653	13'-11¼			46.992		3E(3'-0)	25'-6¾	Pv	
RN	1.3800	1.20	0.26	120		0.000188	1'-0¼	Pf	0.001
653	13'-11¼			46.992			6'-0	Pe	0.425
542	12'-11½			47.418		PO(6'-0)	7'-0¼	Pv	
• • • • • Route 13 • • • • •									
RN	1.3800	1.53	0.33	120		0.000295	0'-11¾	Pf	0.002
536	12'-11¾			45.739		PO(6'-0)	6'-0	Pe	-0.415
571	13'-11¼			45.326			6'-11¾	Pv	
BL	1.3800	1.53	0.33	120		0.000295	16'-7	Pf	0.009
571	13'-11¼			45.326		E(3'-0)	15'-0	Pe	2.036
677	9'-2¾			47.372		2E(3'-0), T(6'-0)	31'-7	Pv	
• • • • • Route 14 • • • • •									
BL	1.3800	8.84	1.90	120		0.007552	32'-2¼	Pf	0.288
629	10'-2¾			48.269			6'-0	Pe	-1.600
576	13'-11			46.957		2E(3'-0)	38'-2¼	Pv	
• • • • • Route 15 • • • • •									
RN	1.3800	8.45	1.81	120		0.006959	1'-0¾	Pf	0.049
532	12'-10¾			46.796		PO(6'-0)	6'-0	Pe	-0.445
575	13'-11¼			46.400			7'-0¾	Pv	

Equivalent Pipe Lengths of Valves and Fittings (C=120 only)

$$\left(\frac{\text{Actual Inside Diameter}}{\text{Schedule 40 Steel Pipe Inside Diameter}}\right)^{4.87} = \text{Factor}$$

C Value Multiplier

Value Of C	100	130	140	150
Multiplying Factor	0.713	1.16	1.33	1.51

Pipe Type	Diameter	Flow	Velocity	HWC		Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Fittings	Eq. Length	Summary
Upstream							Total Length	

Pipe Type Legend

AO	Arm-Over
BL	Branch Line
CM	Cross Main
DN	Drain
DR	Drop
DY	Dynamic
FM	Feed Main
FR	Feed Riser
MS	Miscellaneous
OR	Outrigger
RN	Riser Nipple
SP	Sprig
ST	Stand Pipe
UG	Underground

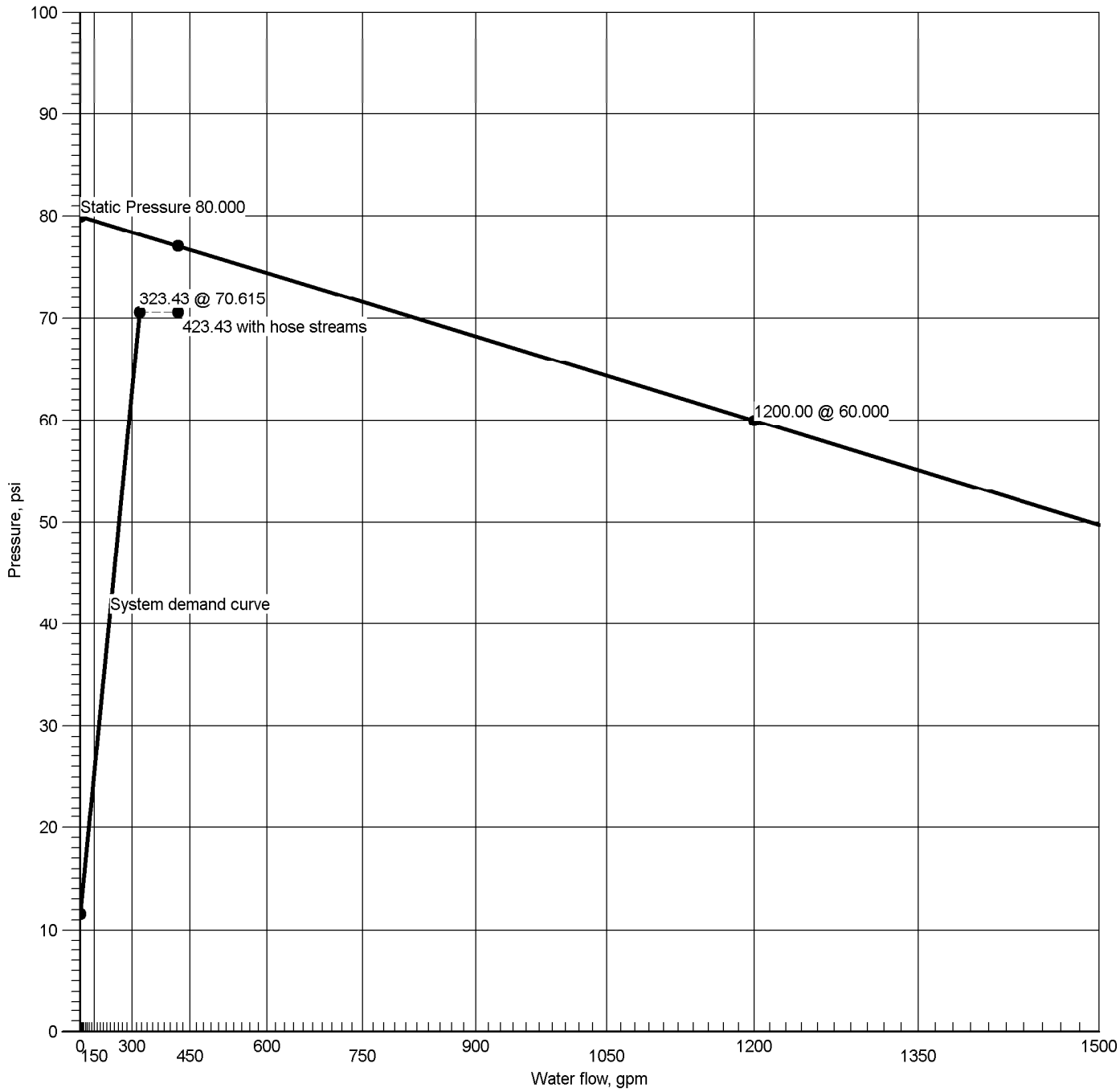
Units Legend

Diameter	Inch
Elevation	Foot
Flow	gpm
Discharge	gpm
Velocity	fps
Pressure	psi
Length	Foot
Friction Loss	psi/Foot
HWC	Hazen-Williams Constant
Pt	Total pressure at a point in a pipe
Pn	Normal pressure at a point in a pipe
Pf	Pressure loss due to friction between points
Pe	Pressure due to elevation difference between indicated points
Pv	Velocity pressure at a point in a pipe

Fittings Legend

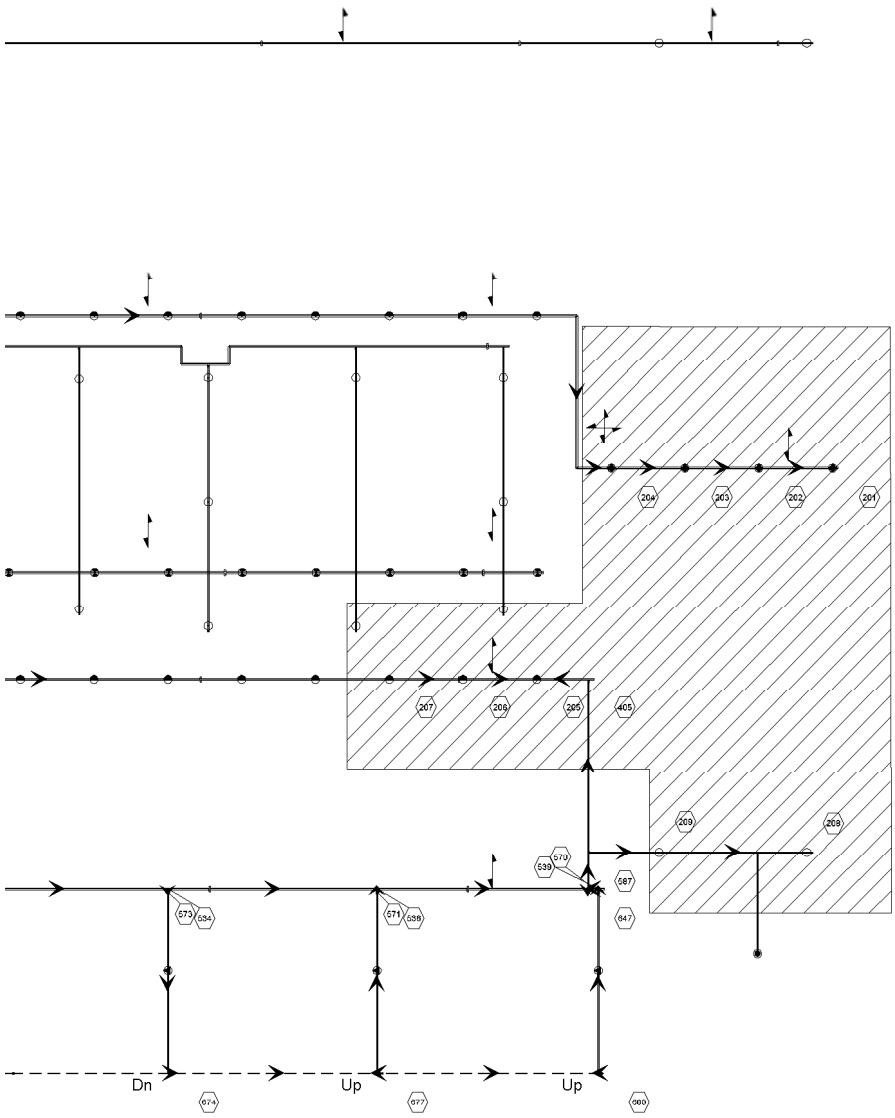
ALV	Alarm Valve
AngV	Angle Valve
b	Bushing
BalV	Ball Valve
BFP	Backflow Preventer
BV	Butterfly Valve
C	Cross Flow Turn 90°
cplg	Coupling
Cr	Cross Run
CV	Check Valve
DelV	Deluge Valve
DPV	Dry Pipe Valve
E	90° Elbow
EE	45° Elbow
Ee1	11¼° Elbow
Ee2	22½° Elbow
f	Flow Device
fd	Flex Drop
FDC	Fire Department Connection
fE	90° FireLock(TM) Elbow
fEE	45° FireLock(TM) Elbow
flg	Flange
FN	Floating Node
fT	FireLock(TM) Tee
g	Gauge
GloV	Globe Valve
GV	Gate Valve
Ho	Hose
Hose	Hose
HV	Hose Valve
Hyd	Hydrant
LtE	Long Turn Elbow
mecT	Mechanical Tee
Noz	Nozzle
P1	Pump In
P2	Pump Out
PIV	Post Indicating Valve
PO	Pipe Outlet
PRV	Pressure Reducing Valve
PrV	Pressure Relief Valve
red	Reducer/Adapter
S	Supply
sCV	Swing Check Valve
Spr	Sprinkler
St	Strainer
T	Tee Flow Turn 90°
Tr	Tee Run
U	Union
WirF	Wirsbo
WMV	Water Meter Valve
Z	Cap

Supply at Node 2



Hydraulic Graph	Supply at Node 2
Static: Pressure	80.000
Residual: Pressure	60.000 @ 1200.00
Available Pressure at Time of Test	77.089 @ 423.43
System Demand	70.615 @ 323.43
System Demand (Including Hose Allowance at Source)	70.615 @ 423.43

Flow Diagram (Current View)



Hydraulic Overview

Job Number: 11-137
Report Description: Light Hazard (Entry EC Calcs)

Job

Job Number 11-137	Design Engineer Franklin Callfas
Job Name: Wallowa Medical Hospital	Phone (541) 848-1798 / FAX
Address 1 Wallowa County Health Care District	State Certification/License Number
Address 2 Enterprise, Oregon, 97828	AHJ
Address 3	Job Site/Building

System

Density 0.100gpm/ft²	Area of Application 1500.00ft² (Actual 1591.85ft²)
Most Demanding Sprinkler Data 5.6 K-Factor 33.00 at 34.726	Hose Streams 100.00
Coverage Per Sprinkler 100.00ft²	Number Of Sprinklers Calculated 7
System Pressure Demand 60.572	System Flow Demand 232.17
Total Demand 332.17 @ 60.572	Pressure Result +17.569 (22.5%)

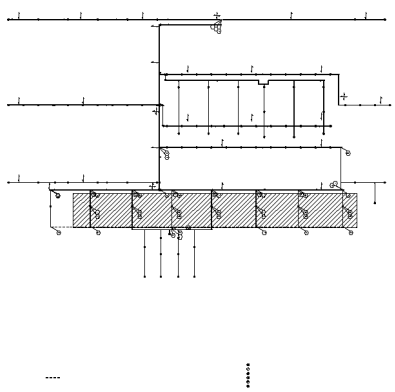
Supplies

Node	Flow(gpm)	Hose Flow(gpm)	Static(psi)	Residual(psi)
2	1200.00	100.00	80.000	60.000

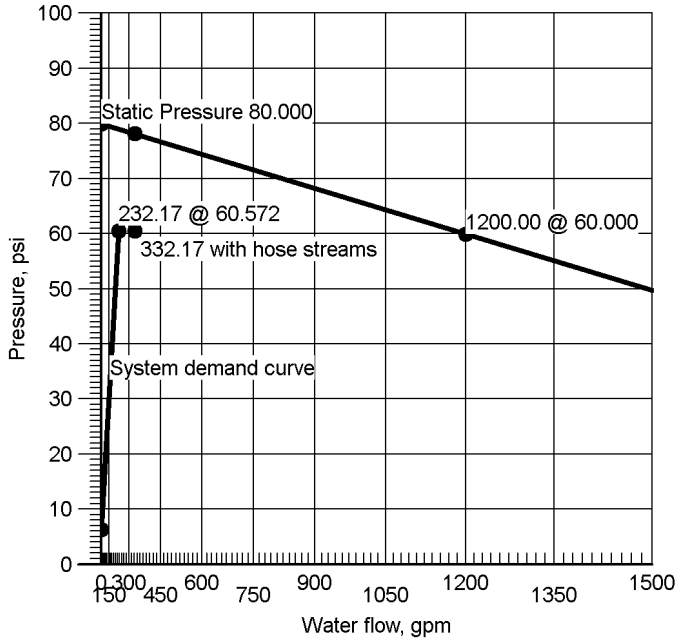
Check Point Gauges

Identifier	Pressure(psi)	K-Factor(K)	Flow(gpm)

Wallowa Rev-0a



Supply at Node 2 (1200.00, 100.00, 80.000, 60.000)



Hydraulic Summary

Job

Job Number: 11-137	Design Engineer: Franklin Callfas
Job Name: Wallowa Medical Hospital	State Certification/License Number:
Address 1: Wallowa County Health Care District	AHJ:
Address 2: Enterprise, Oregon, 97828	Job Site/Building:
Address 3:	Drawing Name: Wallowa Rev-0a

System

Most Demanding Sprinkler Data: 5.6 K-Factor 33.00 at 34.726

Hose Allowance At Source: 100.00

Additional Hose Supplies

Node	Flow(gpm)

Total Hose Streams: 100.00

System Flow Demand	Total Water Required (Including Hose Allowance)
232.17	332.17

Maximum Pressure Unbalance In Loops: 0.000

Maximum Velocity Above Ground: 12.37 between nodes 599 and 307

Maximum Velocity Under Ground: 5.33 between nodes 2 and 5

Volume capacity of Wet Pipes	Volume capacity of Dry Pipes
89.79gal	388.01gal

Remote Area(s)

Occupancy	Job Suffix
Light Hazard (Entry EC Calcs)	
Density	**Area of Application**
0.100gpm/ft²	1500.00ft² (Actual 1591.85ft²)
Number Of Sprinklers Calculated	**Coverage Per Sprinkler**
7	100.00ft²

AutoPeak Results: Pressure For Remote Area(s) Adjacent To Most Remote Area: Left: 63.535

Supplies

Node	Hose Flow (gpm)	Static (psi)	Residual (psi)	@	Flow (gpm)	Available (psi)	@	Total Demand (gpm)	Required (psi)	Safety Margin (psi)
2	100.00	80.000	60.000		1200.00	78.142		332.17	60.572	17.569

Contractor

	Contractor Number	Contact Name	Contact Title
Name of Contractor:		Phone	Extension
Address 1		FAX	
Address 2		E-mail	
Address 3		Web-Site	

Summary Of Outflowing Devices

Job Number: 11-137
Report Description: Light Hazard (Entry EC Calcs)

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)		
Sprinkler	**301**	**33.00**	**33.00**	**5.6**	**34.726**		
Sprinkler	302	33.02	33.00	5.6	34.768		
Sprinkler	303	33.06	33.00	5.6	34.862		
Sprinkler	304	33.20	33.00	5.6	35.140		
Sprinkler	305	33.28	33.00	5.6	35.309		
Sprinkler	306	33.29	33.00	5.6	35.348		
Sprinkler	307	33.32	33.00	5.6	35.407		

Most Demanding Sprinkler Data

Node Analysis

Job Number: 11-137
Report Description: Light Hazard (Entry EC Calcs)

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)	
2	-3'-0	S	60.572	232.17	
301	11'-9¾	Spr(-34.726)	34.726	33.00	
302	11'-9¾	Spr(-34.768)	34.768	33.02	
303	11'-9¾	Spr(-34.862)	34.862	33.06	
304	11'-9¾	Spr(-35.140)	35.140	33.20	
305	11'-9¾	Spr(-35.309)	35.309	33.28	
306	11'-9¾	Spr(-35.348)	35.348	33.29	
307	11'-9¾	Spr(-35.407)	35.407	33.32	
1	-0'-10¼		0.000		
4	-0'-6		0.000		
5	0'-0		58.178		
7	-0'-6		0.000		
29	12'-8½	T(20'-2)	47.144		
32	3'-1	BFP(-5.000)	56.788		
388	12'-9¾	PO(12'-3¾)	41.739		
389	20'-3¾	LtE(3'-8¼)	38.249		
405	20'-5½	PO(6'-0)	37.237		
531	12'-10½	PO(6'-0)	38.990		
532	12'-10¾	PO(6'-0)	38.010		
534	12'-11¼	PO(6'-0)	37.515		
536	12'-11¾	PO(6'-0)	37.399		
539	13'-0¼	PO(6'-0)	37.284		
542	12'-11½	PO(6'-0)	37.275		
544	12'-11	PO(6'-0)	37.345		
546	12'-10½	PO(6'-0)	38.144		
569	12'-10¼	PO(20'-2)	41.123		
570	13'-11¼	E(3'-0)	36.356		
571	13'-11¼	E(3'-0)	36.431		
573	13'-11¼	E(3'-0)	36.530		
574	13'-11¼	E(3'-0)	36.547		
575	13'-11¼	E(3'-0)	37.003		
576	13'-11	E(3'-0)	37.092		
578	13'-11	E(3'-0)	37.604		
597	12'-3½	T(5'-0)	36.759		
598	12'-3½	T(5'-0)	36.977		
599	12'-3½	T(5'-0)	37.038		
600	12'-3½	T(5'-0)	36.936		
601	12'-3½	T(5'-0)	36.467		
602	12'-3½	T(5'-0)	36.368		
603	12'-3½	T(5'-0)	36.324		
629	10'-2¾	T(6'-0)	37.871		
647	13'-0¼	PO(12'-3¾)	37.398		
653	13'-11¼	E(3'-0)	36.805		
665	9'-2¾	E(2'-0)	38.676		
668	9'-2¾	T(6'-0)	38.234		
671	9'-2¾	T(3'-6¾)	38.236		
674	9'-2¾	T(6'-0)	37.799		
677	9'-2¾	T(6'-0)	37.700		
680	9'-2¾	E(3'-0)	37.661		
687	10'-2¾	T(6'-0)	37.838		

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary	
• • • • • Route 1 • • • • •									
DR	1.0490	33.00	12.25	120		0.328645	0'-5¾	Pf	1.803
301	11'-9¾	33.00	5.6	34.726		Sprinkler,	5'-0	Pe	-0.204
603	12'-3½			36.324		T(5'-0)	5'-5¾	Pv	
BL	1.3800	30.80	6.61	120		0.076081	6'-9¼	Pf	0.743
603	12'-3½			36.324			3'-0	Pe	-0.712
570	13'-11¼			36.356		E(3'-0)	9'-9¼	Pv	
RN	1.3800	30.80	6.61	120		0.076081	0'-11½	Pf	0.529
570	13'-11¼			36.356			6'-0	Pe	0.399
539	13'-0¼			37.284		PO(6'-0)	6'-11½	Pv	
CM	2.1570	30.80	2.70	120		0.008642	0'-9¾	Pf	0.113
539	13'-0¼			37.284			12'-3¾	Pe	0.001
647	13'-0¼			37.398		PO(12'-3¾)	13'-1½	Pv	
CM	1.3800	37.27	7.99	120		0.108236	19'-4¼	Pf	3.069
647	13'-0¼	6.47		37.398		Flow (q) from Route 2	9'-0	Pe	-3.230
405	20'-5½			37.237		E(3'-0), PO(6'-0)	28'-4¼	Pv	
CM	2.1570	37.27	3.27	120		0.012295	73'-2¼	Pf	0.945
405	20'-5½			37.237			3'-8¼	Pe	0.067
389	20'-3¾			38.249		LtE(3'-8¼)	76'-10½	Pv	
FR	2.1570	37.27	3.27	120		0.012295	7'-5¾	Pf	0.243
389	20'-3¾			38.249			12'-3¾	Pe	3.246
388	12'-9¾			41.739		PO(12'-3¾)	19'-9½	Pv	
CM	3.2600	232.17	8.92	120		0.048533	76'-8¼	Pf	5.352
388	12'-9¾	194.91		41.739		Flow (q) from Route 3	33'-7¼	Pe	0.053
29	12'-8½			47.144		2LtE(6'-8¾), T(20'-2)	110'-3¼	Pv	
FR	4.2600	232.17	5.23	100		0.018479	6'-3¼	Pf	5.476
29	12'-8½			47.144			19'-5¾	Pe	4.169
32	3'-1			56.788		DPV(8'-2½), BV(11'-3¼), BFP(-5.000)	25'-9	Pv	
FR	4.2600	232.17	5.23	100		0.018479	3'-1	Pf	0.057
32	3'-1			56.788				Pe	1.333
5	0'-0			58.178			3'-1	Pv	
UG	4.2200	232.17	5.33	140		0.010382	88'-3	Pf	1.090
5	0'-0			58.178		Supply,	16'-8¾	Pe	1.304
2	-3'-0			60.572		E(16'-8¾), S	104'-11¾	Pv	
		100.00				Hose Allowance At Source			
2		332.17							
• • • • • Route 2 • • • • •									
DR	1.0490	33.02	12.26	120		0.329012	0'-5¾	Pf	1.805
302	11'-9¾	33.02	5.6	34.768		Sprinkler,	5'-0	Pe	-0.204
602	12'-3½			36.368		T(5'-0)	5'-5¾	Pv	
BL	1.3800	31.49	6.75	120		0.079260	6'-9	Pf	0.774
602	12'-3½			36.368			3'-0	Pe	-0.711
571	13'-11¼			36.431		E(3'-0)	9'-9	Pv	
RN	1.3800	31.49	6.75	120		0.079260	0'-11¾	Pf	0.554
571	13'-11¼			36.431			6'-0	Pe	0.415
536	12'-11¾			37.399		PO(6'-0)	6'-11¾	Pv	
CM	2.1570	6.47	0.57	120		0.000481	17'-2¼	Pf	0.014
536	12'-11¾			37.399			12'-3¾	Pe	-0.016
647	13'-0¼			37.398		PO(12'-3¾)	29'-6	Pv	
• • • • • Route 3 • • • • •									
DR	1.0490	33.06	12.27	120		0.329835	0'-5¾	Pf	1.809
303	11'-9¾	33.06	5.6	34.862		Sprinkler,	5'-0	Pe	-0.204
601	12'-3½			36.467		T(5'-0)	5'-5¾	Pv	
BL	1.3800	31.48	6.75	120		0.079225	6'-9	Pf	0.773
601	12'-3½			36.467			3'-0	Pe	-0.710
573	13'-11¼			36.530		E(3'-0)	9'-9	Pv	
RN	1.3800	31.48	6.75	120		0.079225	1'-0¼	Pf	0.556
573	13'-11¼			36.530			6'-0	Pe	0.429
534	12'-11¼			37.515		PO(6'-0)	7'-0¼	Pv	
CM	2.1570	56.51	4.96	120		0.026557	18'-0	Pf	0.478
534	12'-11¼	25.02		37.515		Flow (q) from Route 13		Pe	0.017
532	12'-10¾			38.010			18'-0	Pv	
CM	2.1570	88.08	7.73	120		0.060367	16'-0	Pf	0.966
532	12'-10¾	31.57		38.010		Flow (q) from Route 5		Pe	0.015
531	12'-10½			38.990			16'-0	Pv	
CM	2.1570	129.37	11.36	120		0.122933	5'-0	Pf	2.128
531	12'-10½	41.29		38.990		Flow (q) from Route 7	12'-3¾	Pe	0.005
569	12'-10¼			41.123		PO(12'-3¾)	17'-3¾	Pv	
CM	3.2600	194.91	7.49	120		0.035113	17'-1¼	Pf	0.600
569	12'-10¼	65.54		41.123		Flow (q) from Route 4		Pe	0.016
388	12'-9¾			41.739			17'-1¼	Pv	

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary
• • • • • Route 4 • • • • •								
DR	1.0490	33.20	12.32	120		0.332274	0'-5¾	Pf 1.823
304	11'-9¾	33.20	5.6	35.140		Sprinkler,	5'-0	Pe -0.204
597	12'-3½			36.759		T(5'-0)	5'-5¾	Pv
BL	1.3800	24.82	5.32	120		0.051027	6'-9	Pf 0.497
597	12'-3½			36.759			3'-0	Pe -0.709
574	13'-11¼			36.547		E(3'-0)	9'-9	Pv
RN	1.3800	24.82	5.32	120		0.051027	1'-0½	Pf 0.359
574	13'-11¼			36.547			6'-0	Pe 0.439
544	12'-11			37.345		PO(6'-0)	7'-0½	Pv
CM	1.6820	32.94	4.76	100		0.046034	17'-0	Pf 0.783
544	12'-11	8.12		37.345		Flow (q) from Route 8		Pe 0.016
546	12'-10½			38.144			17'-0	Pv
CM	1.6820	65.54	9.46	100		0.164408	11'-0	Pf 2.969
546	12'-10½	32.60		38.144		Flow (q) from Route 6	7'-0¾	Pe 0.010
569	12'-10¼			41.123		PO(7'-0¾)	18'-0¾	Pv
• • • • • Route 5 • • • • •								
DR	1.0490	33.28	12.35	120		0.333749	0'-5¾	Pf 1.831
305	11'-9¾	33.28	5.6	35.309		Sprinkler,	5'-0	Pe -0.204
600	12'-3½			36.936		T(5'-0)	5'-5¾	Pv
BL	1.3800	31.57	6.77	120		0.079637	6'-9	Pf 0.776
600	12'-3½			36.936			3'-0	Pe -0.709
575	13'-11¼			37.003		E(3'-0)	9'-9	Pv
RN	1.3800	31.57	6.77	120		0.079637	1'-0¾	Pf 0.562
575	13'-11¼			37.003			6'-0	Pe 0.445
532	12'-10¾			38.010		PO(6'-0)	7'-0¾	Pv
• • • • • Route 6 • • • • •								
DR	1.0490	33.29	12.36	120		0.334092	0'-5¾	Pf 1.833
306	11'-9¾	33.29	5.6	35.348		Sprinkler,	5'-0	Pe -0.204
598	12'-3½			36.977		T(5'-0)	5'-5¾	Pv
BL	1.3800	32.60	6.99	120		0.084530	6'-8¾	Pf 0.823
598	12'-3½			36.977			3'-0	Pe -0.708
576	13'-11			37.092		E(3'-0)	9'-8¾	Pv
RN	1.3800	32.60	6.99	120		0.084530	1'-1	Pf 0.598
576	13'-11			37.092			6'-0	Pe 0.454
546	12'-10½			38.144		PO(6'-0)	7'-1	Pv
• • • • • Route 7 • • • • •								
DR	1.0490	33.32	12.37	120		0.334604	0'-5¾	Pf 1.835
307	11'-9¾	33.32	5.6	35.407		Sprinkler,	5'-0	Pe -0.204
599	12'-3½			37.038		T(5'-0)	5'-5¾	Pv
BL	1.3800	41.29	8.86	120		0.130838	6'-8¾	Pf 1.273
599	12'-3½	7.97		37.038		Flow (q) from Route 9	3'-0	Pe -0.708
578	13'-11			37.604		E(3'-0)	9'-8¾	Pv
RN	1.3800	41.29	8.86	120		0.130838	1'-1	Pf 0.928
578	13'-11			37.604			6'-0	Pe 0.459
531	12'-10½			38.990		PO(6'-0)	7'-1	Pv
• • • • • Route 8 • • • • •								
BL	1.0490	8.12	3.01	120		0.024543	16'-0	Pf 0.442
668	9'-2¾			38.234			2'-0	Pe -0.000
665	9'-2¾			38.676		E(2'-0)	18'-0	Pv
BL	1.3800	8.12	1.74	120		0.006455	16'-6¾	Pf 0.165
665	9'-2¾			38.676			9'-0	Pe -2.036
653	13'-11¼			36.805		3E(3'-0)	25'-6¾	Pv
RN	1.3800	8.12	1.74	120		0.006455	1'-0¼	Pf 0.045
653	13'-11¼			36.805			6'-0	Pe 0.425
542	12'-11½			37.275		PO(6'-0)	7'-0¼	Pv
CM	1.6820	8.12	1.17	100		0.003450	16'-0	Pf 0.055
542	12'-11½			37.275				Pe 0.015
544	12'-11			37.345			16'-0	Pv
• • • • • Route 9 • • • • •								
BL	1.0490	0.26	0.10	100		0.000059	33'-0	Pf 0.002
668	9'-2¾			38.234			3'-6¾	Pe 0.000
671	9'-2¾			38.236		T(3'-6¾)	36'-6¾	Pv
BL	1.3800	5.57	1.20	120		0.003217	2'-0	Pf 0.035
671	9'-2¾	5.31		38.236		Flow (q) from Route 10	9'-0	Pe -0.434
687	10'-2¾			37.838		E(3'-0), T(6'-0)	11'-0	Pv
BL	1.3800	7.28	1.56	120		0.005273	0'-4	Pf 0.033
687	10'-2¾	1.71		37.838		Flow (q) from Route 11	6'-0	Pe
629	10'-2¾			37.871		T(6'-0)	6'-4	Pv
BL	1.3800	7.97	1.71	120		0.006235	9'-5½	Pf 0.059
629	10'-2¾	0.69		37.871		Flow (q) from Route 12		Pe -0.892
599	12'-3½			37.038			9'-5½	Pv
• • • • • Route 10 • • • • •								

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary	
BL	1.0490	3.73	1.38	120		0.005822	17'-0	Pf	0.099
677	9'-2¾	2.20		37.700		Flow (q) from Route 14		Pe	-0.000
674	9'-2¾			37.799			17'-0	Pv	
BL	1.0490	5.31	1.97	120		0.011200	34'-0	Pf	0.437
674	9'-2¾	1.58		37.799		Flow (q) from Route 16	5'-0	Pe	0.000
671	9'-2¾			38.236		T(5'-0)	39'-0	Pv	
• • • • • Route 11 • • • • •									
BL	1.3800	1.71	0.37	120		0.000360	25'-1½	Pf	0.010
600	12'-3½			36.936			3'-0	Pe	0.892
687	10'-2¾			37.838		E(3'-0)	28'-1½	Pv	
• • • • • Route 12 • • • • •									
BL	1.3800	0.69	0.15	120		0.000067	25'-5½	Pf	0.002
598	12'-3½			36.977			9'-0	Pe	0.892
629	10'-2¾			37.871		E(3'-0), T(6'-0)	34'-5½	Pv	
• • • • • Route 13 • • • • •									
CM	2.1570	25.02	2.20	120		0.005885	17'-0	Pf	0.100
536	12'-11¾			37.399				Pe	0.016
534	12'-11¼			37.515			17'-0	Pv	
• • • • • Route 14 • • • • •									
BL	1.0490	2.20	0.82	120		0.002192	18'-0	Pf	0.039
680	9'-2¾			37.661				Pe	0.000
677	9'-2¾			37.700			18'-0	Pv	
• • • • • Route 15 • • • • •									
BL	1.3800	1.53	0.33	120		0.000295	9'-9¾	Pf	0.006
602	12'-3½			36.368			12'-0	Pe	1.326
677	9'-2¾			37.700		2E(3'-0), T(6'-0)	21'-9¾	Pv	
• • • • • Route 16 • • • • •									
BL	1.3800	1.58	0.34	120		0.000313	9'-9¾	Pf	0.007
601	12'-3½			36.467			12'-0	Pe	1.326
674	9'-2¾			37.799		2E(3'-0), T(6'-0)	21'-9¾	Pv	
• • • • • Route 17 • • • • •									
BL	1.3800	8.38	1.80	120		0.006842	9'-9¾	Pf	0.149
597	12'-3½			36.759			12'-0	Pe	1.326
668	9'-2¾			38.234		2E(3'-0), T(6'-0)	21'-9¾	Pv	
• • • • • Route 18 • • • • •									
BL	1.3800	2.20	0.47	120		0.000576	9'-9¾	Pf	0.011
603	12'-3½			36.324			9'-0	Pe	1.326
680	9'-2¾			37.661		3E(3'-0)	18'-9¾	Pv	

Equivalent Pipe Lengths of Valves and Fittings (C=120 only)

$$\left(\frac{\text{Actual Inside Diameter}}{\text{Schedule 40 Steel Pipe Inside Diameter}}\right)^{4.87} = \text{Factor}$$

C Value Multiplier

Value Of C	100	130	140	150
Multiplying Factor	0.713	1.16	1.33	1.51

Pipe Type	Diameter	Flow	Velocity	HWC		Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Fittings	Eq. Length	Summary
Upstream							Total Length	

Pipe Type Legend

AO	Arm-Over
BL	Branch Line
CM	Cross Main
DN	Drain
DR	Drop
DY	Dynamic
FM	Feed Main
FR	Feed Riser
MS	Miscellaneous
OR	Outrigger
RN	Riser Nipple
SP	Sprig
ST	Stand Pipe
UG	Underground

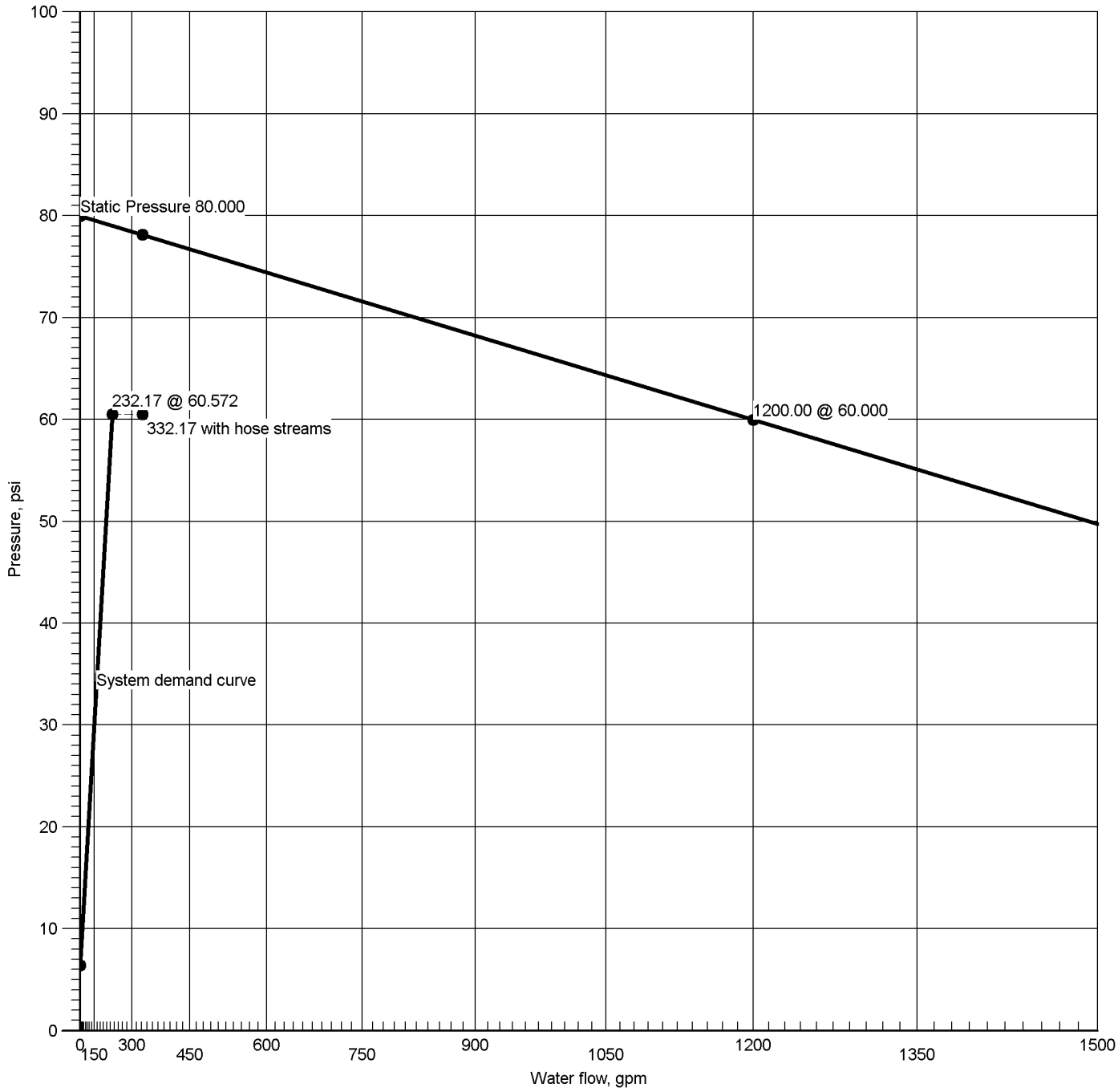
Units Legend

Diameter	Inch
Elevation	Foot
Flow	gpm
Discharge	gpm
Velocity	fps
Pressure	psi
Length	Foot
Friction Loss	psi/Foot
HWC	Hazen-Williams Constant
Pt	Total pressure at a point in a pipe
Pn	Normal pressure at a point in a pipe
Pf	Pressure loss due to friction between points
Pe	Pressure due to elevation difference between indicated points
Pv	Velocity pressure at a point in a pipe

Fittings Legend

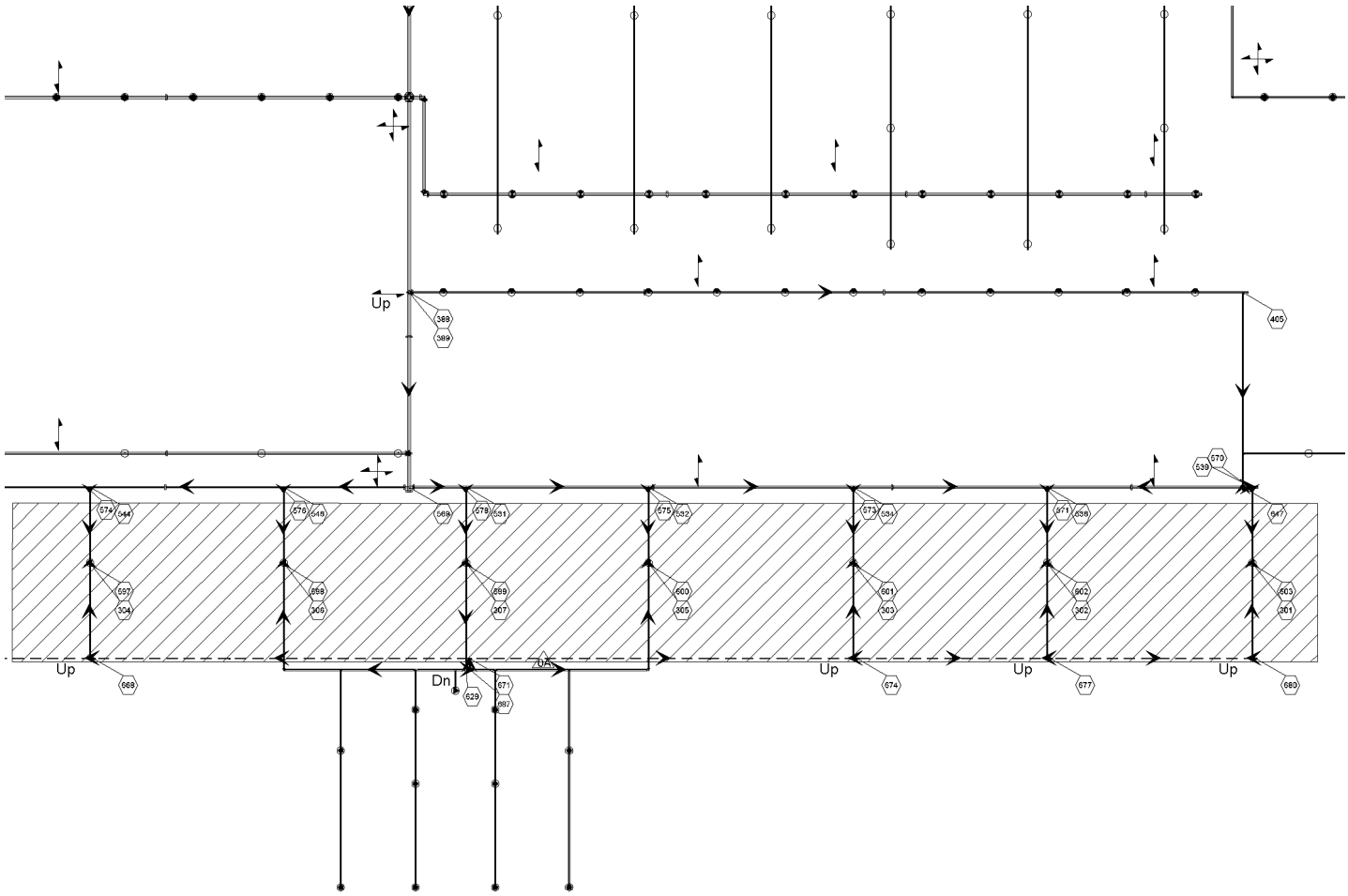
ALV	Alarm Valve
AngV	Angle Valve
b	Bushing
BalV	Ball Valve
BFP	Backflow Preventer
BV	Butterfly Valve
C	Cross Flow Turn 90°
cplg	Coupling
Cr	Cross Run
CV	Check Valve
DelV	Deluge Valve
DPV	Dry Pipe Valve
E	90° Elbow
EE	45° Elbow
Ee1	11¼° Elbow
Ee2	22½° Elbow
f	Flow Device
fd	Flex Drop
FDC	Fire Department Connection
fE	90° FireLock(TM) Elbow
fEE	45° FireLock(TM) Elbow
flg	Flange
FN	Floating Node
fT	FireLock(TM) Tee
g	Gauge
GloV	Globe Valve
GV	Gate Valve
Ho	Hose
Hose	Hose
HV	Hose Valve
Hyd	Hydrant
LtE	Long Turn Elbow
mecT	Mechanical Tee
Noz	Nozzle
P1	Pump In
P2	Pump Out
PIV	Post Indicating Valve
PO	Pipe Outlet
PRV	Pressure Reducing Valve
PrV	Pressure Relief Valve
red	Reducer/Adapter
S	Supply
sCV	Swing Check Valve
Spr	Sprinkler
St	Strainer
T	Tee Flow Turn 90°
Tr	Tee Run
U	Union
WirF	Wirsbo
WMV	Water Meter Valve
Z	Cap

Supply at Node 2



Hydraulic Graph	Supply at Node 2
Static: Pressure	80.000
Residual: Pressure	60.000 @ 1200.00
Available Pressure at Time of Test	78.142 @ 332.17
System Demand	60.572 @ 232.17
System Demand (Including Hose Allowance at Source)	60.572 @ 332.17

Flow Diagram (Current View)



EC ENTRY

Hydraulic Overview

Job Number: 11-137
Report Description: Light Hazard (Entry EC Calcs)

Job

Job Number: 11-137	Design Engineer: Franklin Callfas
Job Name: Wallowa Medical Hospital	Phone: (541) 848-1798 FAX
Address 1: Wallowa County Health Care District	State Certification/License Number
Address 2: Enterprise, Oregon, 97828	AHJ
Address 3	Job Site/Building

System

Density: 0.100gpm/ft²	Area of Application: 1500.00ft² (Actual 1591.85ft²)
Most Demanding Sprinkler Data: 5.6 K-Factor 33.00 at 34.726	Hose Streams: 100.00
Coverage Per Sprinkler: 100.00ft²	Number Of Sprinklers Calculated: 7
System Pressure Demand: 60.572	System Flow Demand: 232.17
Total Demand: 332.17 @ 60.572	Pressure Result: +17.569 (22.5%)

Supplies

Node	Flow(gpm)	Hose Flow(gpm)	Static(psi)	Residual(psi)
2	1200.00	100.00	80.000	60.000

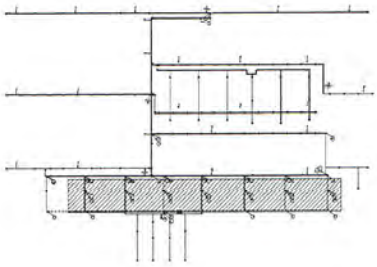
Check Point Gauges

Identifier	Pressure(psi)	K-Factor(K)	Flow(gpm)

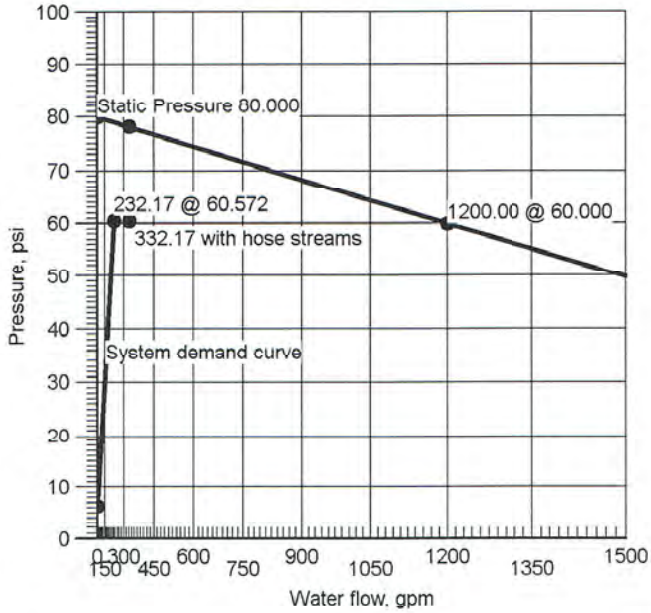
REGISTERED PROFESSIONAL ENGINEER 84637PE OREGON Nov. 19 2110 FRANKLIN D. CALLFAS

Expires 12-31-11

Wallowa Rev-0a



Supply at Node 2 (1200.00, 100.00, 80.000, 60.000)



Hydraulic Summary

Job

Job Number: 11-137	Design Engineer: Franklin Callfas
Job Name: Wallowa Medical Hospital	State Certification/License Number:
Address 1: Wallowa County Health Care District	AHJ:
Address 2: Enterprise, Oregon, 97828	Job Site/Building:
Address 3:	Drawing Name: Wallowa Rev-0a

System

Most Demanding Sprinkler Data: 5.6 K-Factor 33.00 at 34.726	
Hose Allowance At Source: 100.00	
Additional Hose Supplies: Node / Flow(gpm)	
Total Hose Streams: 100.00	
System Flow Demand: 232.17	Total Water Required (Including Hose Allowance): 332.17
Maximum Pressure Unbalance In Loops: 0.000	
Maximum Velocity Above Ground: 12.37 between nodes 599 and 307	
Maximum Velocity Under Ground: 5.33 between nodes 2 and 5	
Volume capacity of Wet Pipes: 89.79gal	Volume capacity of Dry Pipes: 388.01gal

Remote Area(s)

Occupancy: Light Hazard (Entry EC Calcs)	Job Suffix:
Density: 0.100gpm/ft²	Area of Application: 1500.00ft² (Actual 1591.85ft²)
Number Of Sprinklers Calculated: 7	Coverage Per Sprinkler: 100.00ft²
AutoPeak Results: Pressure For Remote Area(s) Adjacent To Most Remote Area: Left: 63.535	

Supplies

Node	Hose Flow (gpm)	Static (psi)	Residual (psi)	@	Flow (gpm)	Available (psi)	@	Total Demand (gpm)	Required (psi)	Safety Margin (psi)
2	100.00	80.000	60.000		1200.00	78.142		332.17	60.572	17.569

Contractor

	Contractor Number	Contact Name	Contact Title
Name of Contractor:		Phone	Extension
Address 1		FAX	
Address 2		E-mail	
Address 3		Web-Site	

Summary Of Outflowing Devices

Job Number: 11-137
Report Description: Light Hazard (Entry EC Calcs)

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)		
Sprinkler	**301**	**33.00**	**33.00**	**5.6**	**34.726**		
Sprinkler	302	33.02	33.00	5.6	34.768		
Sprinkler	303	33.06	33.00	5.6	34.862		
Sprinkler	304	33.20	33.00	5.6	35.140		
Sprinkler	305	33.28	33.00	5.6	35.309		
Sprinkler	306	33.29	33.00	5.6	35.348		
Sprinkler	307	33.32	33.00	5.6	35.407		

Most Demanding Sprinkler Data

Node Analysis

Job Number: 11-137
Report Description: Light Hazard (Entry EC Calcs)

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)	
2	-3'-0	S	60.572	232.17	
301	11'-9¾	Spr(-34.726)	34.726	33.00	
302	11'-9¾	Spr(-34.768)	34.768	33.02	
303	11'-9¾	Spr(-34.862)	34.862	33.06	
304	11'-9¾	Spr(-35.140)	35.140	33.20	
305	11'-9¾	Spr(-35.309)	35.309	33.28	
306	11'-9¾	Spr(-35.348)	35.348	33.29	
307	11'-9¾	Spr(-35.407)	35.407	33.32	
1	-0'-10¼		0.000		
4	-0'-6		0.000		
5	0'-0		58.178		
7	-0'-6		0.000		
29	12'-8½	T(20'-2)	47.144		
32	3'-1	BFP(-5.000)	56.788		
388	12'-9¾	PO(12'-3¾)	41.739		
389	20'-3¾	LtE(3'-8¼)	38.249		
405	20'-5½	PO(6'-0)	37.237		
531	12'-10½	PO(6'-0)	38.990		
532	12'-10¾	PO(6'-0)	38.010		
534	12'-11¼	PO(6'-0)	37.515		
536	12'-11¾	PO(6'-0)	37.399		
539	13'-0¼	PO(6'-0)	37.284		
542	12'-11½	PO(6'-0)	37.275		
544	12'-11	PO(6'-0)	37.345		
546	12'-10½	PO(6'-0)	38.144		
569	12'-10¼	PO(20'-2)	41.123		
570	13'-11¼	E(3'-0)	36.356		
571	13'-11¼	E(3'-0)	36.431		
573	13'-11¼	E(3'-0)	36.530		
574	13'-11¼	E(3'-0)	36.547		
575	13'-11¼	E(3'-0)	37.003		
576	13'-11	E(3'-0)	37.092		
578	13'-11	E(3'-0)	37.604		
597	12'-3½	T(5'-0)	36.759		
598	12'-3½	T(5'-0)	36.977		
599	12'-3½	T(5'-0)	37.038		
600	12'-3½	T(5'-0)	36.936		
601	12'-3½	T(5'-0)	36.467		
602	12'-3½	T(5'-0)	36.368		
603	12'-3½	T(5'-0)	36.324		
629	10'-2¾	T(6'-0)	37.871		
647	13'-0¼	PO(12'-3¾)	37.398		
653	13'-11¼	E(3'-0)	36.805		
665	9'-2¾	E(2'-0)	38.676		
668	9'-2¾	T(6'-0)	38.234		
671	9'-2¾	T(3'-6¾)	38.236		
674	9'-2¾	T(6'-0)	37.799		
677	9'-2¾	T(6'-0)	37.700		
680	9'-2¾	E(3'-0)	37.661		
687	10'-2¾	T(6'-0)	37.838		

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary	
• • • • • Route 1 • • • • •									
DR	1.0490	33.00	12.25	120		0.328645	0'-5¾	Pf	1.803
301	11'-9¾	33.00	5.6	34.726		Sprinkler,	5'-0	Pe	-0.204
603	12'-3½			36.324		T(5'-0)	5'-5¾	Pv	
BL	1.3800	30.80	6.61	120		0.076081	6'-9¼	Pf	0.743
603	12'-3½			36.324			3'-0	Pe	-0.712
570	13'-11¼			36.356		E(3'-0)	9'-9¼	Pv	
RN	1.3800	30.80	6.61	120		0.076081	0'-11½	Pf	0.529
570	13'-11¼			36.356			6'-0	Pe	0.399
539	13'-0¼			37.284		PO(6'-0)	6'-11½	Pv	
CM	2.1570	30.80	2.70	120		0.008642	0'-9¾	Pf	0.113
539	13'-0¼			37.284			12'-3¾	Pe	0.001
647	13'-0¼			37.398		PO(12'-3¾)	13'-1½	Pv	
CM	1.3800	37.27	7.99	120		0.108236	19'-4¼	Pf	3.069
647	13'-0¼	6.47		37.398		Flow (q) from Route 2	9'-0	Pe	-3.230
405	20'-5½			37.237		E(3'-0), PO(6'-0)	28'-4¼	Pv	
CM	2.1570	37.27	3.27	120		0.012295	73'-2¼	Pf	0.945
405	20'-5½			37.237			3'-8¼	Pe	0.067
389	20'-3¾			38.249		LtE(3'-8¼)	76'-10½	Pv	
FR	2.1570	37.27	3.27	120		0.012295	7'-5¾	Pf	0.243
389	20'-3¾			38.249			12'-3¾	Pe	3.246
388	12'-9¾			41.739		PO(12'-3¾)	19'-9½	Pv	
CM	3.2600	232.17	8.92	120		0.048533	76'-8¼	Pf	5.352
388	12'-9¾	194.91		41.739		Flow (q) from Route 3	33'-7¼	Pe	0.053
29	12'-8½			47.144		2LtE(6'-8¾), T(20'-2)	110'-3¼	Pv	
FR	4.2600	232.17	5.23	100		0.018479	6'-3¼	Pf	5.476
29	12'-8½			47.144			19'-5¾	Pe	4.169
32	3'-1			56.788		DPV(8'-2½), BV(11'-3¼), BFP(-5.000)	25'-9	Pv	
FR	4.2600	232.17	5.23	100		0.018479	3'-1	Pf	0.057
32	3'-1			56.788				Pe	1.333
5	0'-0			58.178			3'-1	Pv	
UG	4.2200	232.17	5.33	140		0.010382	88'-3	Pf	1.090
5	0'-0			58.178		Supply,	16'-8¾	Pe	1.304
2	-3'-0			60.572		E(16'-8¾), S	104'-11¾	Pv	
		100.00				Hose Allowance At Source			
2		332.17							
• • • • • Route 2 • • • • •									
DR	1.0490	33.02	12.26	120		0.329012	0'-5¾	Pf	1.805
302	11'-9¾	33.02	5.6	34.768		Sprinkler,	5'-0	Pe	-0.204
602	12'-3½			36.368		T(5'-0)	5'-5¾	Pv	
BL	1.3800	31.49	6.75	120		0.079260	6'-9	Pf	0.774
602	12'-3½			36.368			3'-0	Pe	-0.711
571	13'-11¼			36.431		E(3'-0)	9'-9	Pv	
RN	1.3800	31.49	6.75	120		0.079260	0'-11¾	Pf	0.554
571	13'-11¼			36.431			6'-0	Pe	0.415
536	12'-11¾			37.399		PO(6'-0)	6'-11¾	Pv	
CM	2.1570	6.47	0.57	120		0.000481	17'-2¼	Pf	0.014
536	12'-11¾			37.399			12'-3¾	Pe	-0.016
647	13'-0¼			37.398		PO(12'-3¾)	29'-6	Pv	
• • • • • Route 3 • • • • •									
DR	1.0490	33.06	12.27	120		0.329835	0'-5¾	Pf	1.809
303	11'-9¾	33.06	5.6	34.862		Sprinkler,	5'-0	Pe	-0.204
601	12'-3½			36.467		T(5'-0)	5'-5¾	Pv	
BL	1.3800	31.48	6.75	120		0.079225	6'-9	Pf	0.773
601	12'-3½			36.467			3'-0	Pe	-0.710
573	13'-11¼			36.530		E(3'-0)	9'-9	Pv	
RN	1.3800	31.48	6.75	120		0.079225	1'-0¼	Pf	0.556
573	13'-11¼			36.530			6'-0	Pe	0.429
534	12'-11¼			37.515		PO(6'-0)	7'-0¼	Pv	
CM	2.1570	56.51	4.96	120		0.026557	18'-0	Pf	0.478
534	12'-11¼	25.02		37.515		Flow (q) from Route 13		Pe	0.017
532	12'-10¾			38.010			18'-0	Pv	
CM	2.1570	88.08	7.73	120		0.060367	16'-0	Pf	0.966
532	12'-10¾	31.57		38.010		Flow (q) from Route 5		Pe	0.015
531	12'-10½			38.990			16'-0	Pv	
CM	2.1570	129.37	11.36	120		0.122933	5'-0	Pf	2.128
531	12'-10½	41.29		38.990		Flow (q) from Route 7	12'-3¾	Pe	0.005
569	12'-10¼			41.123		PO(12'-3¾)	17'-3¾	Pv	
CM	3.2600	194.91	7.49	120		0.035113	17'-1¼	Pf	0.600
569	12'-10¼	65.54		41.123		Flow (q) from Route 4		Pe	0.016
388	12'-9¾			41.739			17'-1¼	Pv	

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary
• • • • • Route 4 • • • • •								
DR	1.0490	33.20	12.32	120		0.332274	0'-5¾	Pf 1.823
304	11'-9¾	33.20	5.6	35.140		Sprinkler,	5'-0	Pe -0.204
597	12'-3½			36.759		T(5'-0)	5'-5¾	Pv
BL	1.3800	24.82	5.32	120		0.051027	6'-9	Pf 0.497
597	12'-3½			36.759			3'-0	Pe -0.709
574	13'-11¼			36.547		E(3'-0)	9'-9	Pv
RN	1.3800	24.82	5.32	120		0.051027	1'-0½	Pf 0.359
574	13'-11¼			36.547			6'-0	Pe 0.439
544	12'-11			37.345		PO(6'-0)	7'-0½	Pv
CM	1.6820	32.94	4.76	100		0.046034	17'-0	Pf 0.783
544	12'-11	8.12		37.345		Flow (q) from Route 8		Pe 0.016
546	12'-10½			38.144			17'-0	Pv
CM	1.6820	65.54	9.46	100		0.164408	11'-0	Pf 2.969
546	12'-10½	32.60		38.144		Flow (q) from Route 6	7'-0¾	Pe 0.010
569	12'-10¼			41.123		PO(7'-0¾)	18'-0¾	Pv
• • • • • Route 5 • • • • •								
DR	1.0490	33.28	12.35	120		0.333749	0'-5¾	Pf 1.831
305	11'-9¾	33.28	5.6	35.309		Sprinkler,	5'-0	Pe -0.204
600	12'-3½			36.936		T(5'-0)	5'-5¾	Pv
BL	1.3800	31.57	6.77	120		0.079637	6'-9	Pf 0.776
600	12'-3½			36.936			3'-0	Pe -0.709
575	13'-11¼			37.003		E(3'-0)	9'-9	Pv
RN	1.3800	31.57	6.77	120		0.079637	1'-0¾	Pf 0.562
575	13'-11¼			37.003			6'-0	Pe 0.445
532	12'-10¾			38.010		PO(6'-0)	7'-0¾	Pv
• • • • • Route 6 • • • • •								
DR	1.0490	33.29	12.36	120		0.334092	0'-5¾	Pf 1.833
306	11'-9¾	33.29	5.6	35.348		Sprinkler,	5'-0	Pe -0.204
598	12'-3½			36.977		T(5'-0)	5'-5¾	Pv
BL	1.3800	32.60	6.99	120		0.084530	6'-8¾	Pf 0.823
598	12'-3½			36.977			3'-0	Pe -0.708
576	13'-11			37.092		E(3'-0)	9'-8¾	Pv
RN	1.3800	32.60	6.99	120		0.084530	1'-1	Pf 0.598
576	13'-11			37.092			6'-0	Pe 0.454
546	12'-10½			38.144		PO(6'-0)	7'-1	Pv
• • • • • Route 7 • • • • •								
DR	1.0490	33.32	12.37	120		0.334604	0'-5¾	Pf 1.835
307	11'-9¾	33.32	5.6	35.407		Sprinkler,	5'-0	Pe -0.204
599	12'-3½			37.038		T(5'-0)	5'-5¾	Pv
BL	1.3800	41.29	8.86	120		0.130838	6'-8¾	Pf 1.273
599	12'-3½	7.97		37.038		Flow (q) from Route 9	3'-0	Pe -0.708
578	13'-11			37.604		E(3'-0)	9'-8¾	Pv
RN	1.3800	41.29	8.86	120		0.130838	1'-1	Pf 0.928
578	13'-11			37.604			6'-0	Pe 0.459
531	12'-10½			38.990		PO(6'-0)	7'-1	Pv
• • • • • Route 8 • • • • •								
BL	1.0490	8.12	3.01	120		0.024543	16'-0	Pf 0.442
668	9'-2¾			38.234			2'-0	Pe -0.000
665	9'-2¾			38.676		E(2'-0)	18'-0	Pv
BL	1.3800	8.12	1.74	120		0.006455	16'-6¾	Pf 0.165
665	9'-2¾			38.676			9'-0	Pe -2.036
653	13'-11¼			36.805		3E(3'-0)	25'-6¾	Pv
RN	1.3800	8.12	1.74	120		0.006455	1'-0¼	Pf 0.045
653	13'-11¼			36.805			6'-0	Pe 0.425
542	12'-11½			37.275		PO(6'-0)	7'-0¼	Pv
CM	1.6820	8.12	1.17	100		0.003450	16'-0	Pf 0.055
542	12'-11½			37.275				Pe 0.015
544	12'-11			37.345			16'-0	Pv
• • • • • Route 9 • • • • •								
BL	1.0490	0.26	0.10	100		0.000059	33'-0	Pf 0.002
668	9'-2¾			38.234			3'-6¾	Pe 0.000
671	9'-2¾			38.236		T(3'-6¾)	36'-6¾	Pv
BL	1.3800	5.57	1.20	120		0.003217	2'-0	Pf 0.035
671	9'-2¾	5.31		38.236		Flow (q) from Route 10	9'-0	Pe -0.434
687	10'-2¾			37.838		E(3'-0), T(6'-0)	11'-0	Pv
BL	1.3800	7.28	1.56	120		0.005273	0'-4	Pf 0.033
687	10'-2¾	1.71		37.838		Flow (q) from Route 11	6'-0	Pe
629	10'-2¾			37.871		T(6'-0)	6'-4	Pv
BL	1.3800	7.97	1.71	120		0.006235	9'-5½	Pf 0.059
629	10'-2¾	0.69		37.871		Flow (q) from Route 12		Pe -0.892
599	12'-3½			37.038			9'-5½	Pv
• • • • • Route 10 • • • • •								

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary	
BL	1.0490	3.73	1.38	120		0.005822	17'-0	Pf	0.099
677	9'-2¾	2.20		37.700		Flow (q) from Route 14		Pe	-0.000
674	9'-2¾			37.799			17'-0	Pv	
BL	1.0490	5.31	1.97	120		0.011200	34'-0	Pf	0.437
674	9'-2¾	1.58		37.799		Flow (q) from Route 16	5'-0	Pe	0.000
671	9'-2¾			38.236		T(5'-0)	39'-0	Pv	
• • • • • Route 11 • • • • •									
BL	1.3800	1.71	0.37	120		0.000360	25'-1½	Pf	0.010
600	12'-3½			36.936			3'-0	Pe	0.892
687	10'-2¾			37.838		E(3'-0)	28'-1½	Pv	
• • • • • Route 12 • • • • •									
BL	1.3800	0.69	0.15	120		0.000067	25'-5½	Pf	0.002
598	12'-3½			36.977			9'-0	Pe	0.892
629	10'-2¾			37.871		E(3'-0), T(6'-0)	34'-5½	Pv	
• • • • • Route 13 • • • • •									
CM	2.1570	25.02	2.20	120		0.005885	17'-0	Pf	0.100
536	12'-11¾			37.399				Pe	0.016
534	12'-11¼			37.515			17'-0	Pv	
• • • • • Route 14 • • • • •									
BL	1.0490	2.20	0.82	120		0.002192	18'-0	Pf	0.039
680	9'-2¾			37.661				Pe	0.000
677	9'-2¾			37.700			18'-0	Pv	
• • • • • Route 15 • • • • •									
BL	1.3800	1.53	0.33	120		0.000295	9'-9¾	Pf	0.006
602	12'-3½			36.368			12'-0	Pe	1.326
677	9'-2¾			37.700		2E(3'-0), T(6'-0)	21'-9¾	Pv	
• • • • • Route 16 • • • • •									
BL	1.3800	1.58	0.34	120		0.000313	9'-9¾	Pf	0.007
601	12'-3½			36.467			12'-0	Pe	1.326
674	9'-2¾			37.799		2E(3'-0), T(6'-0)	21'-9¾	Pv	
• • • • • Route 17 • • • • •									
BL	1.3800	8.38	1.80	120		0.006842	9'-9¾	Pf	0.149
597	12'-3½			36.759			12'-0	Pe	1.326
668	9'-2¾			38.234		2E(3'-0), T(6'-0)	21'-9¾	Pv	
• • • • • Route 18 • • • • •									
BL	1.3800	2.20	0.47	120		0.000576	9'-9¾	Pf	0.011
603	12'-3½			36.324			9'-0	Pe	1.326
680	9'-2¾			37.661		3E(3'-0)	18'-9¾	Pv	

Equivalent Pipe Lengths of Valves and Fittings (C=120 only)

$$\left(\frac{\text{Actual Inside Diameter}}{\text{Schedule 40 Steel Pipe Inside Diameter}}\right)^{4.87} = \text{Factor}$$

C Value Multiplier

Value Of C	100	130	140	150
Multiplying Factor	0.713	1.16	1.33	1.51

Pipe Type	Diameter	Flow	Velocity	HWC		Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Fittings	Eq. Length	Summary
Upstream							Total Length	

Pipe Type Legend

AO	Arm-Over
BL	Branch Line
CM	Cross Main
DN	Drain
DR	Drop
DY	Dynamic
FM	Feed Main
FR	Feed Riser
MS	Miscellaneous
OR	Outrigger
RN	Riser Nipple
SP	Sprig
ST	Stand Pipe
UG	Underground

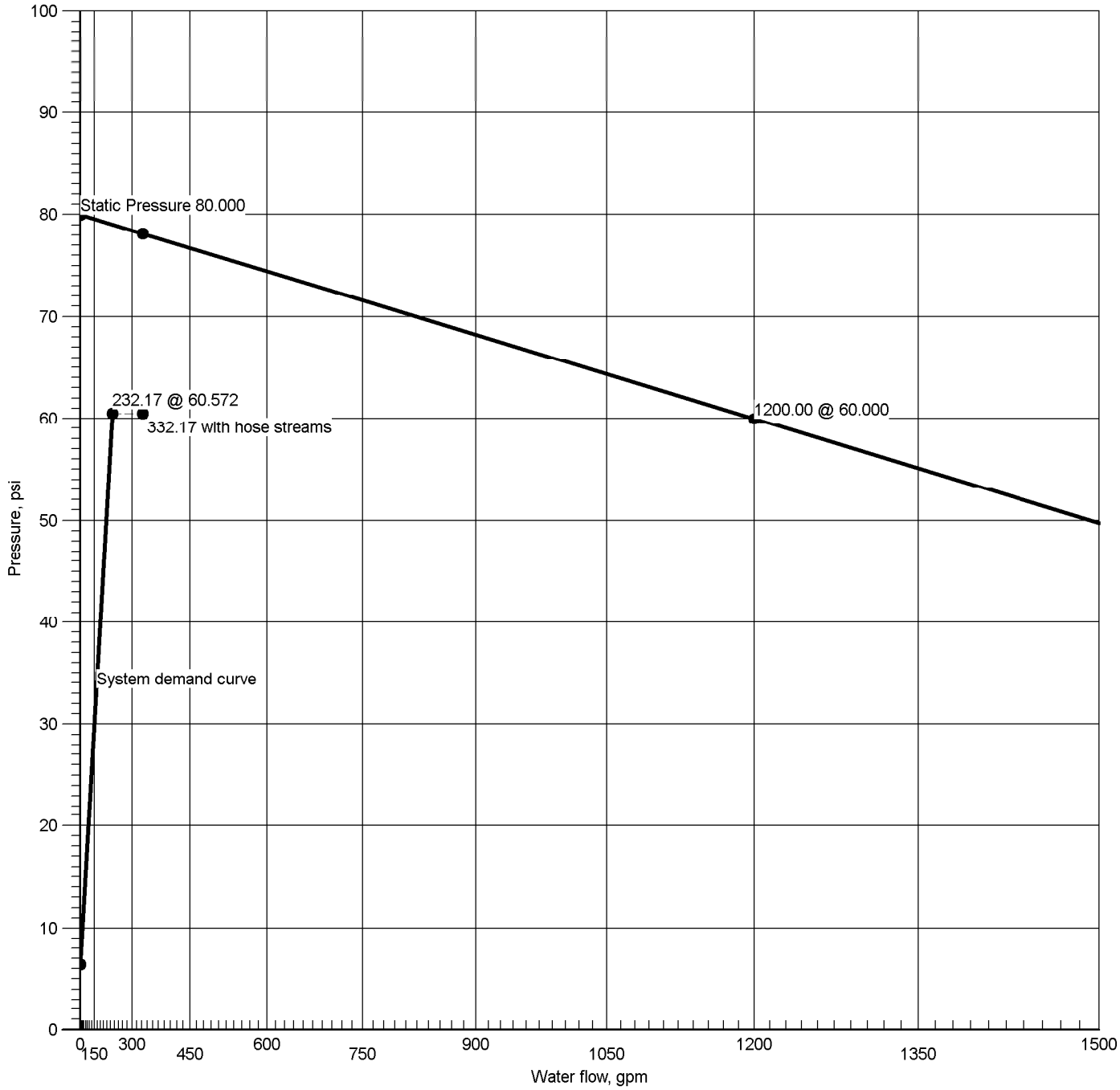
Units Legend

Diameter	Inch
Elevation	Foot
Flow	gpm
Discharge	gpm
Velocity	fps
Pressure	psi
Length	Foot
Friction Loss	psi/Foot
HWC	Hazen-Williams Constant
Pt	Total pressure at a point in a pipe
Pn	Normal pressure at a point in a pipe
Pf	Pressure loss due to friction between points
Pe	Pressure due to elevation difference between indicated points
Pv	Velocity pressure at a point in a pipe

Fittings Legend

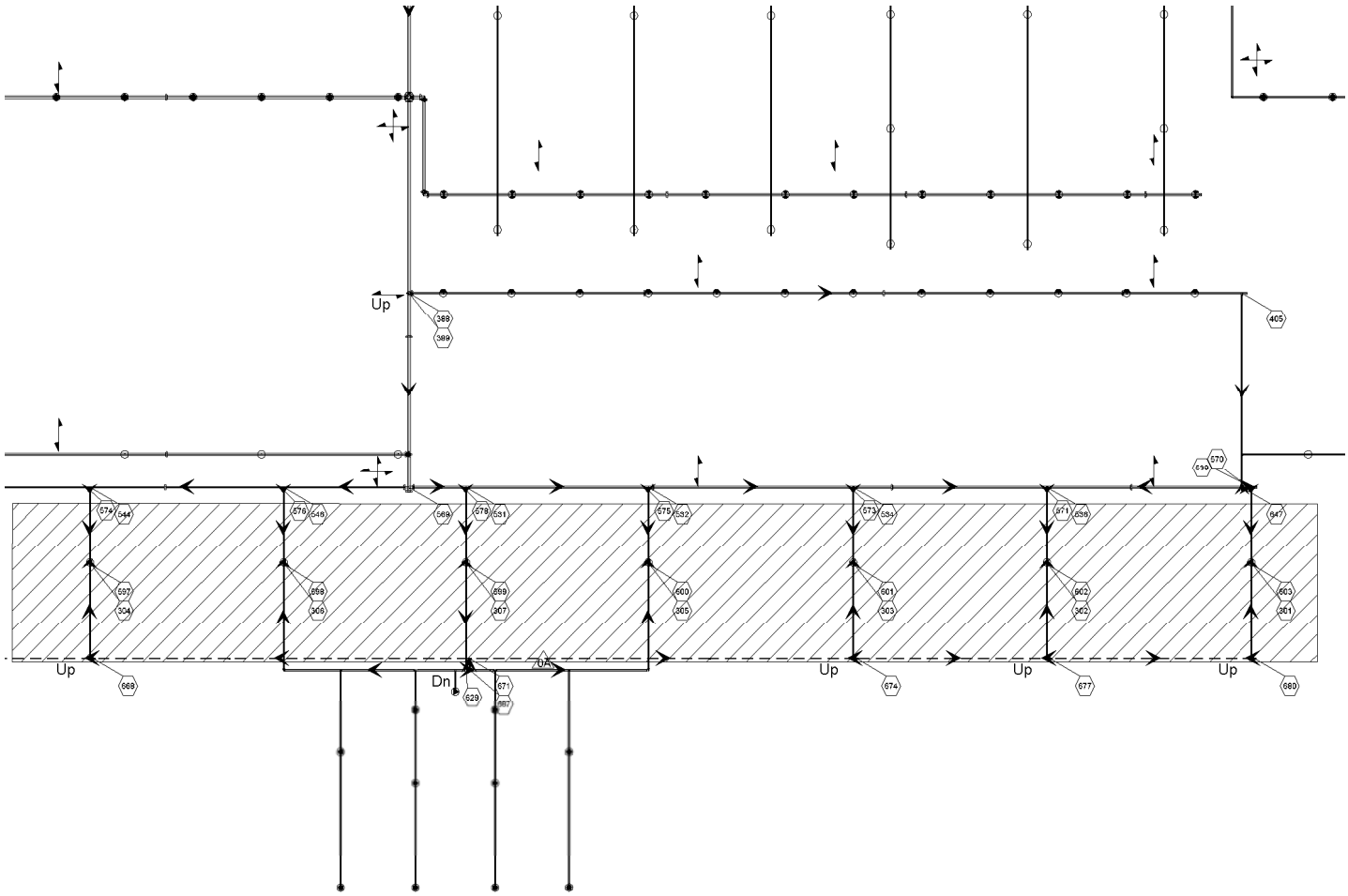
ALV	Alarm Valve
AngV	Angle Valve
b	Bushing
BalV	Ball Valve
BFP	Backflow Preventer
BV	Butterfly Valve
C	Cross Flow Turn 90°
cplg	Coupling
Cr	Cross Run
CV	Check Valve
DelV	Deluge Valve
DPV	Dry Pipe Valve
E	90° Elbow
EE	45° Elbow
Ee1	11¼° Elbow
Ee2	22½° Elbow
f	Flow Device
fd	Flex Drop
FDC	Fire Department Connection
fE	90° FireLock(TM) Elbow
fEE	45° FireLock(TM) Elbow
flg	Flange
FN	Floating Node
fT	FireLock(TM) Tee
g	Gauge
GloV	Globe Valve
GV	Gate Valve
Ho	Hose
Hose	Hose
HV	Hose Valve
Hyd	Hydrant
LtE	Long Turn Elbow
mecT	Mechanical Tee
Noz	Nozzle
P1	Pump In
P2	Pump Out
PIV	Post Indicating Valve
PO	Pipe Outlet
PRV	Pressure Reducing Valve
PrV	Pressure Relief Valve
red	Reducer/Adapter
S	Supply
sCV	Swing Check Valve
Spr	Sprinkler
St	Strainer
T	Tee Flow Turn 90°
Tr	Tee Run
U	Union
WirF	Wirsbo
WMV	Water Meter Valve
Z	Cap

Supply at Node 2



Hydraulic Graph	Supply at Node 2
Static: Pressure	80.000
Residual: Pressure	60.000 @ 1200.00
Available Pressure at Time of Test	78.142 @ 332.17
System Demand	60.572 @ 232.17
System Demand (Including Hose Allowance at Source)	60.572 @ 332.17

Flow Diagram (Current View)



LAT

Tol-Brace Seismic Calculations

Project Address: WALLOWA MEDICAL CENTER

ENTERPRISE

OREGON

Job #

SEVERSON FIRE BEND

(541) 382-3720

TOLCO NIBCO

Calculations based on 2007 NFPA Pamphlet #13

Brace Information

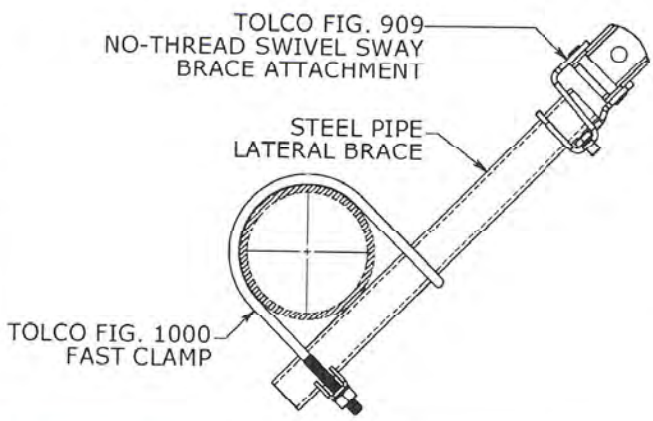
Maximum Spacing	28' 0" (8.53 m)
Maximum Brace Length	7' 0" (2.14 m)
Bracing Material	1" Sch.40
Angle from Vertical	60° Min.
Least Rad. of Gyration	0.421" (11 mm)
L/R Value	200
Max Horizontal Load	2124 lbs (963 kg)
Force Factor (Cp)	0.4

Tolco Brace Components

Tolco Component Fig. Number	Adjusted Load
Fig.1000 Clamp	1745 lbs (792 kg)
Fig.909 No-Thread Swivel	1745 lbs (792 kg)

*Calculation Based on CONCENTRIC Loading
*Please Note: These calculations are for Tolco components only. Use of any other components voids these calculations and the listing of the assembly.

Assembly Detail



Fastener Information

Fastener Orientation	NFPA Type I
Type	Dual Through-Bolts - Fig.906
Diameter	1/2in. (13 mm)
Length	Minimum 4x Wood Member
Maximum Load	538 lbs (244 kg)

Brace Identification on Plans	LATERAL
Orientation of Brace	Lateral

Braced Pipe: 2" Sch.10 Steel Pipe

Load Information

Size and Type of Pipe	Total Length	Total Calculated Load
2" Sch.10 Steel Pipe (50.8 mm)	28ft (8.5 m)	47 lbs (21 kg)
1.25" Sch.10 Steel Pipe (31.75 mm)	150ft (45.7 m)	151 lbs (68 kg)
1" Sch.10 Steel Pipe (25.4 mm)	20ft (6.1 m)	14 lbs (6 kg)
Percentage added for Fittings and Sprinklers	15%	32 lbs (14.52 kg)
Total Adjusted Load of all pipe within Zone of Influence		245 lbs (111 kg)

REGISTERED PROFESSIONAL ENGINEER 84637PE OREGON Nov. 19 2110 FRANKLIN D. CALLFAS

Expires 12-31-11

(Tol-Brace Version 7)

Tol-Brace Seismic Calculations

WALLOWA MEDICAL CENTER Job #

ENTERPRISE

Brace Identification	LATERAL
Brace Type (Per NFPA#13)	NFPA Type I
Braced Pipe	2" Sch.10 Steel Pipe
Spacing of Brace	28' 0" (8.53 m)
Orientation of Brace	Lateral
Bracing Material	1" Sch.40
Maximum Brace Length	7' 0" (2.14 m)
Slenderness Ratio used for Load Calculation	200
True Angle of Brace for Calculation	60°
Type of Fastener	1/2 (13 mm) Dual Through-Bolts Parallel to Beam - TOLCO Fig 906
Length of Fastener	Minimum 4x Wood Member

Summary of Pipe within Zone of Influence

2" Sch.10 Steel Pipe (50.8 mm)	28ft (8.5 m)
1.25" Sch.10 Steel Pipe (31.75 mm)	150ft (45.7 m)
1" Sch.10 Steel Pipe (25.4 mm)	20ft (6.1 m)

G-Factor Used 0.4

Allowance for Heads and Fittings	15%

Conclusions

Total Adjusted Load of Pipe in Zone of Influence	245 lbs (111 kg)
Material Capacity	2124 lbs (963 kg)
Fastener Capacity	538 lbs (244 kg)
Fig.1000 Clamp	1745 lbs (792 kg)
Fig.909 No-Thread Swivel	1745 lbs (792 kg)
Structural Member	WOOD BEAM

Calculations prepared by F.C. FPE

*The description of the Structual Member is for informational purposes only.
Tol-Brace software calculates the brace assembly only, not the structure it is attached to.
Calculated with Tol-Brace 7
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Tol-Brace Seismic Calculations

Project Address: WALLOWA MEDICAL CENTER

ENTERPRISE

OREGON

Job #

SEVERSON FIRE BEND

(541) 382-3720

Calculations based on 2007 NFPA Pamphlet #13

Brace Information

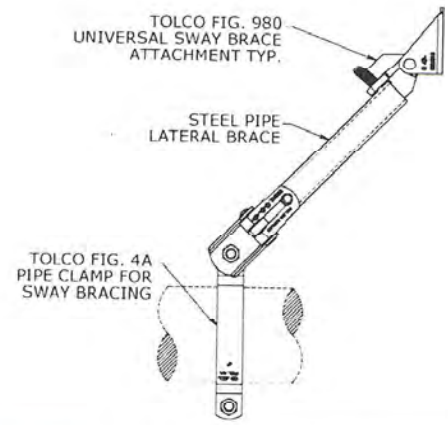
Maximum Spacing	60' 0" (18.29 m)
Maximum Brace Length	7' 0" (2.14 m)
Bracing Material	1" Sch.40
Angle from Vertical	60° Min.
Least Rad. of Gyration	0.421" (11 mm)
L/R Value	200
Max Horizontal Load	2124 lbs (963 kg)
Force Factor (Cp)	0.4

Tolco Brace Components

Tolco Component Fig. Number	Adjusted Load
Fig.4 Clamp	329 lbs (149 kg)
Fig.980 Universal Swivel	2395 lbs (1086 kg)

*Calculation Based on CONCENTRIC Loading
*Please Note: These calculations are for Tolco components only. Use of any other components voids these calculations and the listing of the assembly.

Assembly Detail



Fastener Information

Fastener Orientation	NFPA Type F
Type	Dual Through-Bolts - Fig.906
Diameter	1/2in. (13 mm)
Length	Minimum 4x Wood Member
Maximum Load	734 lbs (333 kg)

Brace Identification on Plans	LONGITUDINAL
Orientation of Brace	Longitudinal

Braced Pipe: 2" Sch.10 Steel Pipe

Load Information

Size and Type of Pipe	Total Length	Total Calculated Load
2" Sch.10 Steel Pipe (50.8 mm)	60ft (18.3 m)	101 lbs (46 kg)
Percentage added for Fittings and Sprinklers	15%	15 lbs (6.8 kg)
Total Adjusted Load of all pipe within Zone of Influence		116 lbs (53 kg)

REGISTERED PROFESSIONAL ENGINEER 84637PE OREGON NOV. 19 2110 FRANKLIN D. CALLFAS

Expires 12-31-11

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Tol-Brace Seismic Calculations

WALLOWA MEDICAL CENTER Job #

ENTERPRISE

Brace Identification	LONGITUDINAL
Brace Type (Per NFPA#13)	NFPA Type F
Braced Pipe	2" Sch.10 Steel Pipe
Spacing of Brace	60' 0" (18.29 m)
Orientation of Brace	Longitudinal
Bracing Material	1" Sch.40
Maximum Brace Length	7' 0" (2.14 m)
Slenderness Ratio used for Load Calculation	200
True Angle of Brace for Calculation	60°
Type of Fastener	1/2 (13 mm) Dual Through-Bolts Perpendicular to Beam - TOLCO Fig 9(
Length of Fastener	Minimum 4x Wood Member

Summary of Pipe within Zone of Influence

2" Sch.10 Steel Pipe (50.8 mm)	60ft (18.3 m)

G-Factor Used 0.4

Allowance for Heads and Fittings	15%

Conclusions

Total Adjusted Load of Pipe in Zone of Influence	116 lbs (53 kg)
Material Capacity	2124 lbs (963 kg)
Fastener Capacity	734 lbs (333 kg)
Fig.4 Clamp	329 lbs (149 kg)
Fig.980 Universal Swivel	2395 lbs (1086 kg)
Structural Member	WOOD BEAM

Calculations prepared by F.C. FPE

*The description of the Structual Member is for informational purposes only.
Tol-Brace software calculates the brace assembly only, not the structure it is attached to.
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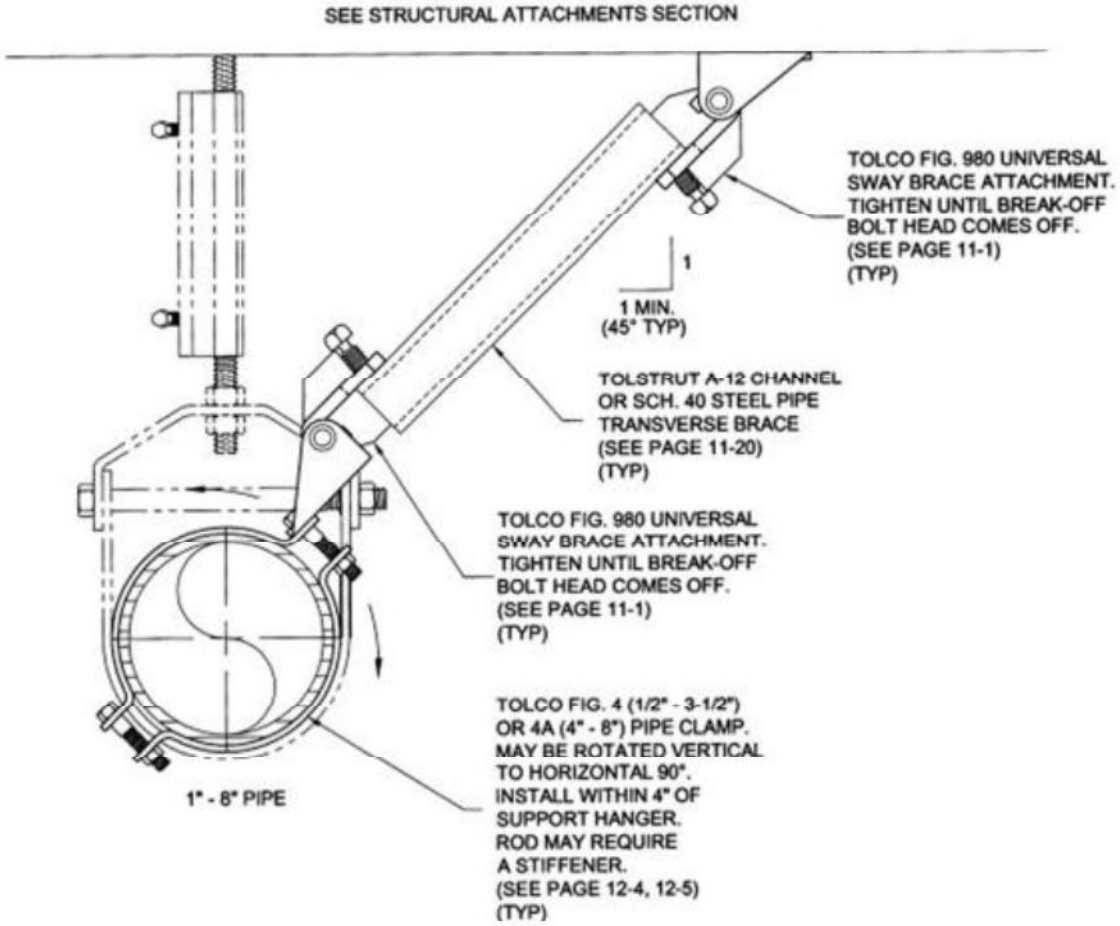
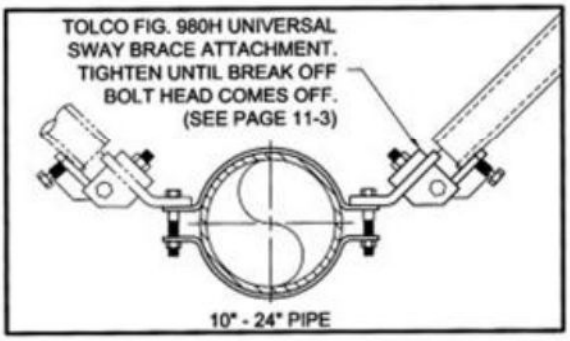
DETAIL 1C

PIPE CLAMP TRANSVERSE RIGID BRACE

1/2" THROUGH 24" PIPE SIZE





A P P R O V E D
Fixed Equipment Anchorage
Office of Statewide Health Planning and Development

OPA- 0300 July 21, 2003

**** Valid for 3 Years Maximum ****

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ZUBAIR SHEIKH
No. 4039
Exp. 12-31-03
STRUCTURAL
STATE OF CALIFORNIA

STRUCTURAL ENGINEER S 4039

PAGE: 2 - 4 DATE: July 21, 2003