1. Project Overview

- **Project Title:** Tenant - Fire Station 209 and 210
- **Location:** 2691 Sandalwood Parkway East, Brampton, Ontario
- **Scope of Work:** Mechanical equipment replacement and upgrade, including installation of two new backflow preventers (BFPs).
- **Permit Application Date:** February 28, 2025
- **Review Date:** April 3, 2025
- **Requested By:** City of Brampton – Building Division

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2. Purpose of this Report

This report is prepared to demonstrate compliance with the City's Notice of Building Review Deficiencies dated April 3, 2025. Specifically, it addresses the requirement to prove that the installation of new backflow preventers will **not adversely impact** the performance of the existing sprinkler systems at Fire Stations 209 and 210.

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3. Systems Reviewed

- Wet Pipe Sprinkler System
- Dry Pipe Sprinkler System

Hydraulic calculations were conducted for both systems, before and after the installation of the new backflow preventers.

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4. Hydraulic Analysis Summary

4.1 Wet Pipe Sprinkler System

Item	Without BFP	With BFP
Total Flow Demand	273.5 GPM	273.5 GPM
Available Pressure	59.7 psi	59.7 psi
Required Pressure	46.8 psi	51.7 psi
Pressure Margin	+12.9 psi	+8.0 psi

Result: Even after including a 5 psi pressure loss from the BFP, the available pressure exceeds the required pressure by 8.0 psi.

Conclusion:

No negative impact on the wet sprinkler system.

4.2 Dry Pipe Sprinkler System

4.2.1 Hydraulic Analysis without Riser Modification (Original System)

Item	Value
Total Flow Demand	355.0 GPM
Available Pressure	59.4 psi
Required Pressure	61.8 psi
Pressure Margin	-2.4 psi

Observation:

- After including the backflow preventer's pressure loss (~5 psi), the available pressure (59.4 psi) is insufficient to meet the required pressure (61.8 psi).
- This results in a deficit of 2.4 psi.

Conclusion:

In the original configuration, the installation of the new backflow **preventer negatively impacts** the dry sprinkler system's hydraulic performance.

4.2.2 Hydraulic Analysis after Riser Modification (Upgrading to 4" Riser)

Item	Value
Total Flow Demand	355.0 GPM
Available Pressure	59.4 psi
Required Pressure	53.9 psi
Pressure Margin	+5.5 psi

Observation:

- By increasing the riser size from 3" to 4", the frictional losses were reduced.
- The system now requires only 53.9 psi to satisfy the sprinkler demand.
- The available pressure (59.4 psi) exceeds the required pressure by a margin of 5.5 psi.

Conclusion:

After upgrading the riser to 4", the installation of the backflow preventers no longer negatively affects the dry sprinkler system. Adequate pressure is available to meet system demand in compliance with NFPA 13.

5. Backflow Preventer Details

- **Model:** Watts 350DA
- **Type:** Double Check Detector Assembly (DCDA)
- **Size:** 8 inch
- **Pressure Loss at 355 GPM:** Approximately 5 psi (as per manufacturer's published data)

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6. Conclusion

Based on the revised hydraulic calculations and system modifications, it is confirmed that:

- The installation of the new backflow preventers does not adversely affect the hydraulic performance of either the wet pipe or dry pipe sprinkler systems.
- The sprinkler systems remain compliant with the performance criteria established by **NFPA 13** and the requirements outlined by the City of Brampton.

Thus, the deficiency noted by the City of Brampton has been successfully addressed.

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7. Attachments

- Hydraulic Calculations – Wet System (Before and After BFP Installation)
- Hydraulic Calculations – Dry System (Before and After BFP Installation, and After Riser Upgrade)
- Backflow Preventer Datasheets (Watts 350DA)
- Original Notice of Building Review Deficiencies (City of Brampton Letter)
- Wet System Isometric
- Dry System Isometric

Hydraulic Calculations

Project Name: TENANT - FIRE STATION 209 & 210

DESIGN DATA:

Remote Area Location: Ground Floor

System Type: Wet

Hazard: Ordinary Hazard Group-1

Design Density: 0.15 gpm/ sq. ft

Remote Area: Maximum 1500 SQ. FT

Number of Sprinklers in Remote Area: 12 Nos

Sprinkler Classification: Quick Response Sprinklers

Maximum Sprinkler Coverage: 130 sq. ft

Sprinkler K-Factor: K5.6

CALCULATING END SPRINKLER FLOW IN REMOTE AREA

Design Density = 0.15 gpm/sq ft

Maximum area covered by one sprinkler = 130 sq. ft

Flow required at end sprinkler = 0.15 x 130 gpm

= 19.5 gpm

CACLULATING END SPRINKLER PRESSURE

Using equation.

$Q = K \times \sqrt{P}$

Where, Q = Flow in gpm (gallons per minute)
K = Sprinkler constant given by manufacture data sheet
P = Pressure at sprinkler in psi (pound per square inch)

Once the flow (Q) is calculated, the required pressure (P) can be calculated by simply rearranging the above formula:

$P = (\frac{Q}{k})^2$

Q = 19.5 gpm

K = 5.6

Therefore, Pressure required at end sprinkler = (19.5/5.6)^2 = 12.12 psi.

Therefore, our calculation shall start at Pressure P = 12.12 psi.

DATE: 4/28/20254.HYDRAULICCALCULATIONS\WORKING\WET SYSTEM WITHOUT BFP.SDF
JOB TITLE:

WATER SUPPLY DATA

SOURCE NODE TAG	STATIC PRESS. (PSI)	RESID. PRESS. (PSI)	@ FLOW (GPM)	AVAIL. PRESS. (PSI)	@ TOTAL DEMAND (GPM)	REQ'D PRESS. (PSI)
SRC	60.0	55.0	1160.0	59.7	273.5	46.8

AGGREGATE FLOW ANALYSIS:

TOTAL FLOW AT SOURCE	273.5 GPM
TOTAL HOSE STREAM ALLOWANCE AT SOURCE	0.0 GPM
OTHER HOSE STREAM ALLOWANCES	0.0 GPM
TOTAL DISCHARGE FROM ACTIVE SPRINKLERS	273.5 GPM

NODE ANALYSIS DATA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)
S1	17.0	K= 5.60	12.3	19.6
S2	17.0	K= 5.60	13.9	20.9
S3	17.0	K= 5.60	13.1	20.3
S4	17.0	K= 5.60	12.1	19.5
S5	17.0	K= 5.60	17.4	23.4
S6	17.0	K= 5.60	19.6	24.8
S7	17.0	K= 5.60	16.0	22.4
S8	17.0	K= 5.60	14.8	21.5
S9	17.0	K= 5.60	19.3	24.6
S10	17.0	K= 5.60	21.8	26.1
S11	17.0	K= 5.60	21.1	25.7
S12	17.0	K= 5.60	19.2	24.5
20	17.0	- - - -	17.7	- - -
21	17.0	- - - -	21.5	- - -
22	17.0	- - - -	26.1	- - -
23	17.0	- - - -	31.3	- - -
24	17.0	- - - -	34.5	- - -
25	17.0	- - - -	35.3	- - -
26	17.0	- - - -	35.7	- - -
27	2.0	- - - -	43.6	- - -
28	2.0	- - - -	43.6	- - -
29	0.0	- - - -	44.5	- - -
30	0.0	- - - -	44.5	- - -
31	0.0	- - - -	44.5	- - -
SRC	-5.0	SOURCE	46.8	273.5

DATE: 4/28/20254.HYDRAULICCALCULATIONS\WORKING\WET SYSTEM WITHOUT BFP.SDF
JOB TITLE:

PIPE DATA

PIPE TAG / END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) FL/FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 1					-19.6	1.049 PL	13.00	PF	1.6
S1	17.0	5.6	12.3	19.6	7.3	120 FTG	----	PE	0.0
S2	17.0	5.6	13.9	20.9		0.126 TL	13.00	PV	
Pipe: 2					-40.6	1.049 PL	2.80	PF	3.8
S2	17.0	5.6	13.9	20.9	15.1	120 FTG	T	PE	0.0
20	17.0	0.0	17.7	0.0		0.481 TL	7.80	PV	
Pipe: 3					-19.5	1.049 PL	8.16	PF	1.0
S4	17.0	5.6	12.1	19.5	7.2	120 FTG	----	PE	0.0
S3	17.0	5.6	13.1	20.3		0.124 TL	8.16	PV	
Pipe: 4					-39.8	1.049 PL	9.82	PF	4.6
S3	17.0	5.6	13.1	20.3	14.8	120 FTG	----	PE	0.0
20	17.0	0.0	17.7	0.0		0.465 TL	9.82	PV	
Pipe: 5					-23.4	1.049 PL	13.00	PF	2.3
S5	17.0	5.6	17.4	23.4	8.7	120 FTG	----	PE	0.0
S6	17.0	5.6	19.6	24.8		0.173 TL	13.00	PV	
Pipe: 6					-48.2	1.049 PL	2.80	PF	1.9
S6	17.0	5.6	19.6	24.8	17.9	120 FTG	----	PE	0.0
21	17.0	0.0	21.5	0.0		0.662 TL	2.80	PV	
Pipe: 7					-21.5	1.049 PL	8.16	PF	1.2
S8	17.0	5.6	14.8	21.5	8.0	120 FTG	----	PE	0.0
S7	17.0	5.6	16.0	22.4		0.149 TL	8.16	PV	
Pipe: 8					-44.0	1.049 PL	9.82	PF	5.5
S7	17.0	5.6	16.0	22.4	16.3	120 FTG	----	PE	0.0
21	17.0	0.0	21.5	0.0		0.558 TL	9.82	PV	
Pipe: 9					-80.3	1.610 PL	10.00	PF	3.8
20	17.0	0.0	17.7	0.0	12.7	120 FTG	T	PE	0.0
21	17.0	0.0	21.5	0.0		0.212 TL	18.00	PV	
Pipe: 10					-24.6	1.049 PL	13.00	PF	2.5
S9	17.0	5.6	19.3	24.6	9.1	120 FTG	----	PE	0.0
S10	17.0	5.6	21.8	26.1		0.191 TL	13.00	PV	
Pipe: 11					-50.7	1.049 PL	6.00	PF	4.4
S10	17.0	5.6	21.8	26.1	18.8	120 FTG	----	PE	0.0
22	17.0	0.0	26.1	0.0		0.727 TL	6.00	PV	
Pipe: 12					-24.5	1.049 PL	10.00	PF	1.9
S12	17.0	5.6	19.2	24.5	9.1	120 FTG	----	PE	0.0
S11	17.0	5.6	21.1	25.7		0.190 TL	10.00	PV	
Pipe: 13					-50.3	1.049 PL	7.00	PF	5.0
S11	17.0	5.6	21.1	25.7	18.7	120 FTG	----	PE	0.0
22	17.0	0.0	26.1	0.0		0.716 TL	7.00	PV	
Pipe: 14					-172.5	2.067 PL	7.91	PF	4.6
21	17.0	0.0	21.5	0.0	16.5	120 FTG	T	PE	0.0
22	17.0	0.0	26.1	0.0		0.258 TL	17.91	PV	

PIPE TAG / END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) FL/FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 15					-273.4	2.469 PL	20.22	PF	5.1
22	17.0	0.0	26.1	0.0	18.3	120 FTG	----	PE	0.0
23	17.0	0.0	31.3	0.0		0.254 TL	20.22	PV	
Pipe: 16					-273.4	3.068 PL	30.00	PF	3.3
23	17.0	0.0	31.3	0.0	11.9	120 FTG	E	PE	0.0
24	17.0	0.0	34.5	0.0		0.088 TL	37.00	PV	
Pipe: 17					-273.4	4.026 PL	24.82	PF	0.8
24	17.0	0.0	34.5	0.0	6.9	120 FTG	E	PE	0.0
25	17.0	0.0	35.3	0.0		0.023 TL	34.82	PV	
Pipe: 18					-273.4	4.026 PL	5.00	PF	0.4
25	17.0	0.0	35.3	0.0	6.9	120 FTG	E	PE	0.0
26	17.0	0.0	35.7	0.0		0.023 TL	15.00	PV	
Pipe: 19					273.4	4.026 PL	15.00	PF	1.4
27	2.0	0.0	43.6	0.0	6.9	120 FTG	TCG	PE	-6.5
26	17.0	0.0	35.7	0.0		0.023 TL	59.00	PV	
Pipe: 20					-273.4	7.981 PL	2.00	PF	0.0
27	2.0	0.0	43.6	0.0	1.8	120 FTG	E	PE	0.0
28	2.0	0.0	43.6	0.0		0.001 TL	20.00	PV	
Pipe: 21					-273.4	7.981 PL	2.00	PF	0.0
28	2.0	0.0	43.6	0.0	1.8	120 FTG	E	PE	0.9
29	0.0	0.0	44.5	0.0		0.001 TL	20.00	PV	
Pipe: 22					-273.4	7.981 PL	7.00	PF	0.0
29	0.0	0.0	44.5	0.0	1.8	120 FTG	E	PE	0.0
30	0.0	0.0	44.5	0.0		0.001 TL	25.00	PV	
Pipe: 23					-273.4	7.981 PL	5.00	PF	0.0
30	0.0	0.0	44.5	0.0	1.8	120 FTG	E	PE	0.0
31	0.0	0.0	44.5	0.0		0.001 TL	23.00	PV	
Pipe: 24					-273.5	7.981 PL	82.00	PF	0.1
31	0.0	0.0	44.5	0.0	1.8	120 FTG	----	PE	2.2
SRC	-5.0	SRCE	46.8	(N/A)		0.001 TL	82.00	PV	

NOTES (HASS):

(1) Calculations were performed by the HASS computer program in accordance with NFPA (2020) under license no. 65699794 granted by

HRS Systems, Inc.
208 Southside Square
Petersburg, TN 37144
(931) 659-9760

(2) The system has been calculated to provide an average imbalance at each node of 0.002 gpm and a maximum imbalance at any node of 0.059 gpm.

(3) Total pressure at each node is used in balancing the system. Maximum water velocity is 18.8 ft/sec at pipe 11.

(4) Items listed in bold print on the cover sheet

are automatically transferred from the calculation report.

(5) Available pressure at source node SRC under full flow conditions is 59.54 psi with a flow of 318.91 gpm.

(6) PIPE FITTINGS TABLE

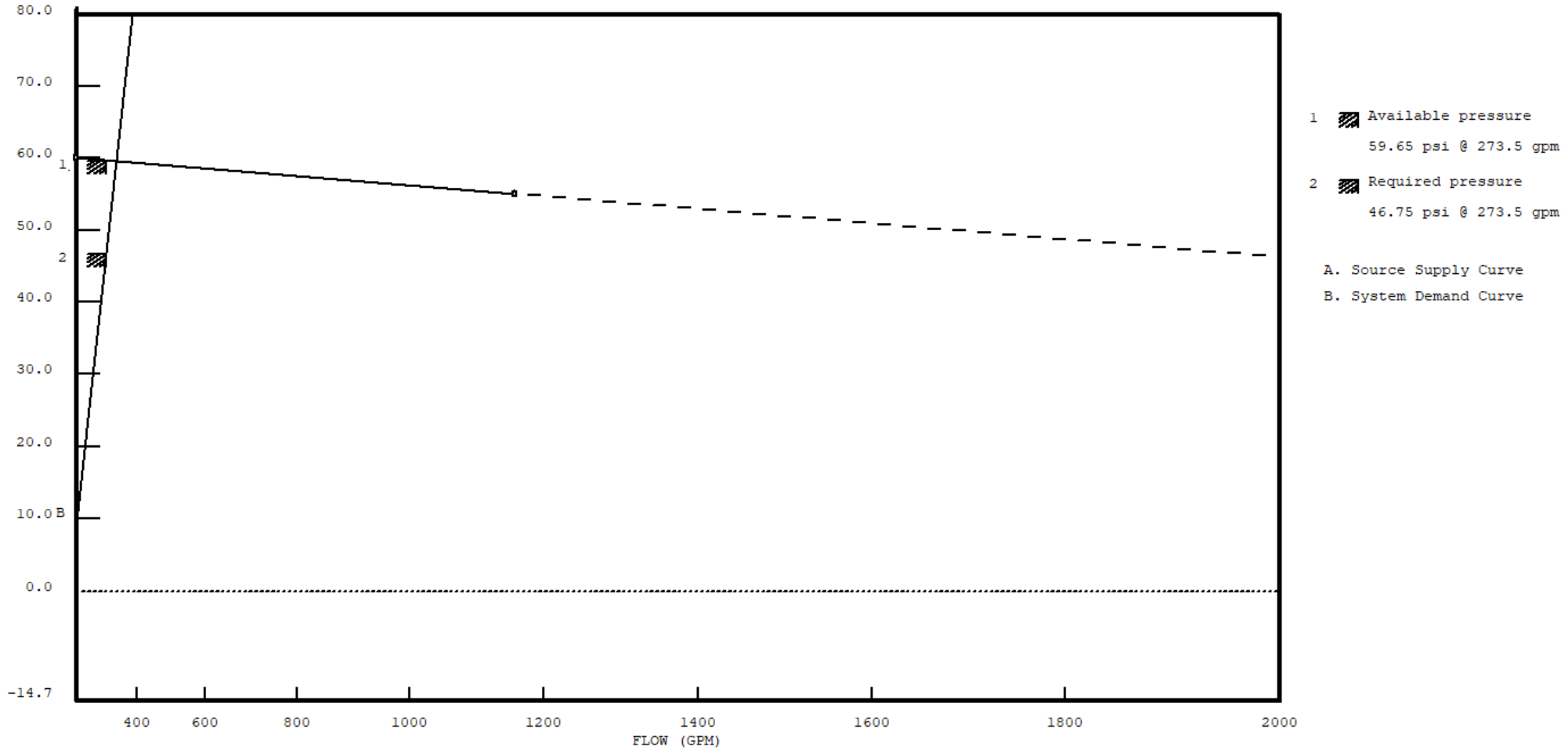
HASS Pipe Table Name: standard

PAGE: A MATERIAL: S40 HWC: 120

Diameter (in)	Equivalent Fitting Lengths in Feet								
	E Ell	T Tee	L LngEll	C ChkVlv	B BfyVlv	G GatVlv	A AlmChk	D DPVlv	N NTee
	F F45Ell								
1.049	2.00 1.00	5.00	2.00	5.00	6.00	1.00	10.00	2.00	5.00
1.610	4.00 2.00	8.00	2.00	9.00	6.00	1.00	10.00	10.00	8.00
2.067	5.00 2.50	10.00	3.00	11.00	6.00	1.00	10.00	10.00	10.00
2.469	6.00 3.00	12.00	4.00	14.00	7.00	1.00	10.00	10.00	12.00
3.068	7.00 3.50	15.00	5.00	16.00	10.00	1.00	13.00	13.00	15.00
4.026	10.00 5.00	20.00	6.00	22.00	12.00	2.00	20.00	20.00	20.00
7.981	18.00 9.00	35.00	13.00	45.00	12.00	4.00	31.00	31.00	35.00

WATER SUPPLY ANALYSIS

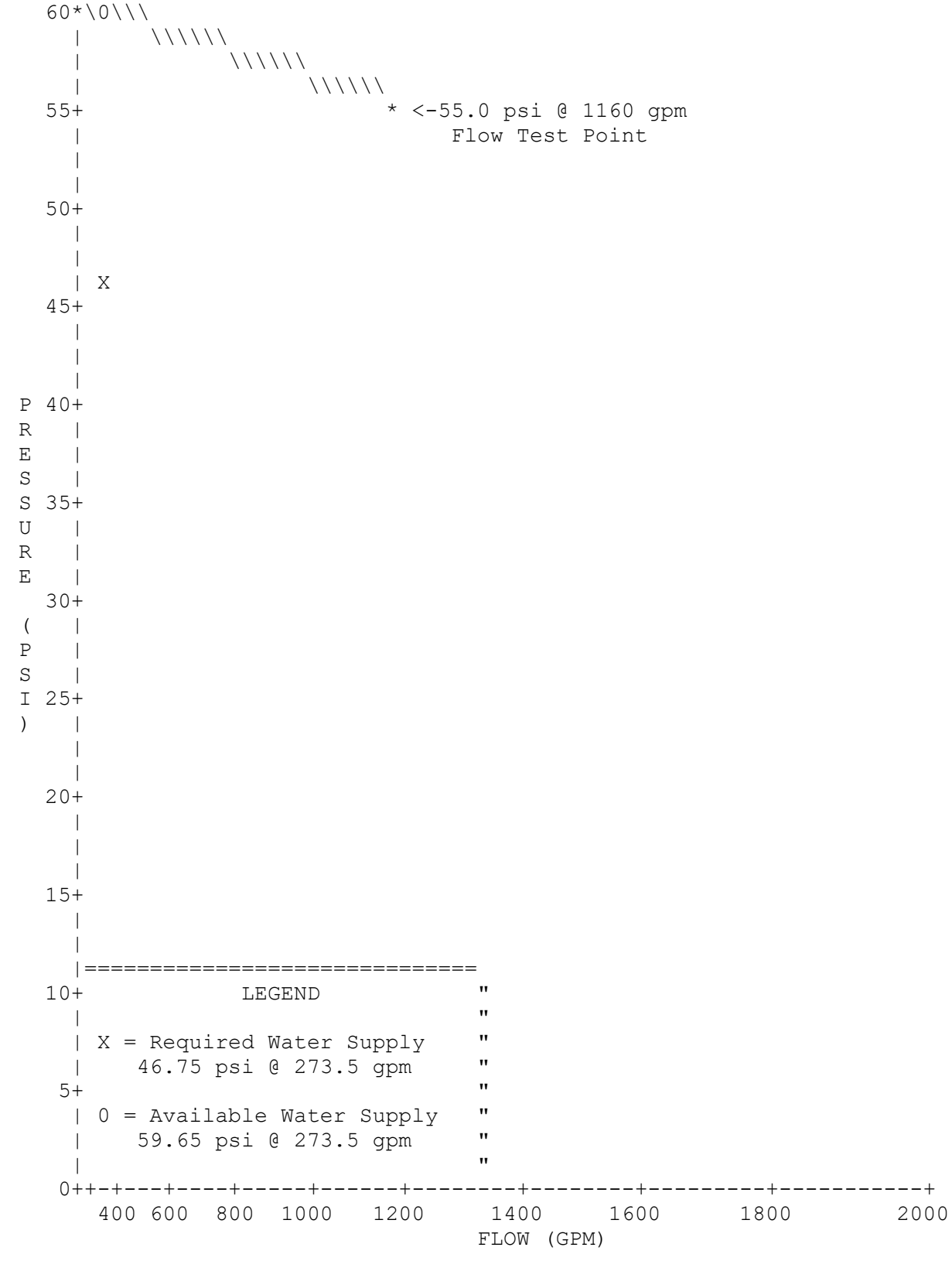
Static: 60.00 psi Resid: 55.00 psi Flow: 1160.0 gpm



Note: (1) Dashed Lines indicate extrapolated values from Test Results

DATE: 4/28/20254.HYDRAULICCALCULATIONS\WORKING\WET SYSTEM WITHOUT BFP.SDF
JOB TITLE:

WATER SUPPLY CURVE



DATE: 4/28/2025HYDRAULICCALCULATIONS\WORKING\WET SYSTEM INCLUDING BFP.SDF
JOB TITLE:

WATER SUPPLY DATA

SOURCE NODE TAG	STATIC PRESS. (PSI)	RESID. PRESS. (PSI)	@ FLOW (GPM)	AVAIL. PRESS. (PSI)	@ TOTAL DEMAND (GPM)	REQ'D PRESS. (PSI)
SRC	60.0	55.0	1160.0	59.7	273.5	51.7

AGGREGATE FLOW ANALYSIS:

TOTAL FLOW AT SOURCE	273.5 GPM
TOTAL HOSE STREAM ALLOWANCE AT SOURCE	0.0 GPM
OTHER HOSE STREAM ALLOWANCES	0.0 GPM
TOTAL DISCHARGE FROM ACTIVE SPRINKLERS	273.5 GPM

NODE ANALYSIS DATA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)
S1	17.0	K= 5.60	12.3	19.6
S2	17.0	K= 5.60	13.9	20.9
S3	17.0	K= 5.60	13.1	20.3
S4	17.0	K= 5.60	12.1	19.5
S5	17.0	K= 5.60	17.4	23.4
S6	17.0	K= 5.60	19.6	24.8
S7	17.0	K= 5.60	16.0	22.4
S8	17.0	K= 5.60	14.8	21.5
S9	17.0	K= 5.60	19.3	24.6
S10	17.0	K= 5.60	21.8	26.1
S11	17.0	K= 5.60	21.1	25.7
S12	17.0	K= 5.60	19.2	24.5
20	17.0	- - - -	17.7	- - -
21	17.0	- - - -	21.5	- - -
22	17.0	- - - -	26.1	- - -
23	17.0	- - - -	31.3	- - -
24	17.0	- - - -	34.5	- - -
25	17.0	- - - -	35.3	- - -
26	17.0	- - - -	35.7	- - -
27	2.0	- - - -	43.6	- - -
28	2.0	- - - -	43.6	- - -
29	0.0	- - - -	44.5	- - -
BFP-IN	0.0	- - - -	49.5	- - -
BFP-OUT	0.0	- - - -	44.5	- - -
30	0.0	- - - -	49.5	- - -
31	0.0	- - - -	49.5	- - -
SRC	-5.0	SOURCE	51.7	273.5

DATE: 4/28/2025HYDRAULICCALCULATIONS\WORKING\WET SYSTEM INCLUDING BFP.SDF
JOB TITLE:

PIPE DATA

PIPE TAG / END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) FL/FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 1					-19.6	1.049 PL	13.00	PF	1.6
S1	17.0	5.6	12.3	19.6	7.3	120 FTG	----	PE	0.0
S2	17.0	5.6	13.9	20.9		0.126 TL	13.00	PV	
Pipe: 2					-40.6	1.049 PL	2.80	PF	3.8
S2	17.0	5.6	13.9	20.9	15.1	120 FTG	T	PE	0.0
20	17.0	0.0	17.7	0.0		0.481 TL	7.80	PV	
Pipe: 3					-19.5	1.049 PL	8.16	PF	1.0
S4	17.0	5.6	12.1	19.5	7.2	120 FTG	----	PE	0.0
S3	17.0	5.6	13.1	20.3		0.124 TL	8.16	PV	
Pipe: 4					-39.8	1.049 PL	9.82	PF	4.6
S3	17.0	5.6	13.1	20.3	14.8	120 FTG	----	PE	0.0
20	17.0	0.0	17.7	0.0		0.465 TL	9.82	PV	
Pipe: 5					-23.4	1.049 PL	13.00	PF	2.3
S5	17.0	5.6	17.4	23.4	8.7	120 FTG	----	PE	0.0
S6	17.0	5.6	19.6	24.8		0.173 TL	13.00	PV	
Pipe: 6					-48.2	1.049 PL	2.80	PF	1.9
S6	17.0	5.6	19.6	24.8	17.9	120 FTG	----	PE	0.0
21	17.0	0.0	21.5	0.0		0.662 TL	2.80	PV	
Pipe: 7					-21.5	1.049 PL	8.16	PF	1.2
S8	17.0	5.6	14.8	21.5	8.0	120 FTG	----	PE	0.0
S7	17.0	5.6	16.0	22.4		0.149 TL	8.16	PV	
Pipe: 8					-44.0	1.049 PL	9.82	PF	5.5
S7	17.0	5.6	16.0	22.4	16.3	120 FTG	----	PE	0.0
21	17.0	0.0	21.5	0.0		0.558 TL	9.82	PV	
Pipe: 9					-80.3	1.610 PL	10.00	PF	3.8
20	17.0	0.0	17.7	0.0	12.7	120 FTG	T	PE	0.0
21	17.0	0.0	21.5	0.0		0.212 TL	18.00	PV	
Pipe: 10					-24.6	1.049 PL	13.00	PF	2.5
S9	17.0	5.6	19.3	24.6	9.1	120 FTG	----	PE	0.0
S10	17.0	5.6	21.8	26.1		0.191 TL	13.00	PV	
Pipe: 11					-50.7	1.049 PL	6.00	PF	4.4
S10	17.0	5.6	21.8	26.1	18.8	120 FTG	----	PE	0.0
22	17.0	0.0	26.1	0.0		0.727 TL	6.00	PV	
Pipe: 12					-24.5	1.049 PL	10.00	PF	1.9
S12	17.0	5.6	19.2	24.5	9.1	120 FTG	----	PE	0.0
S11	17.0	5.6	21.1	25.7		0.190 TL	10.00	PV	
Pipe: 13					-50.3	1.049 PL	7.00	PF	5.0
S11	17.0	5.6	21.1	25.7	18.7	120 FTG	----	PE	0.0
22	17.0	0.0	26.1	0.0		0.716 TL	7.00	PV	
Pipe: 14					-172.5	2.067 PL	7.91	PF	4.6
21	17.0	0.0	21.5	0.0	16.5	120 FTG	T	PE	0.0
22	17.0	0.0	26.1	0.0		0.258 TL	17.91	PV	

DATE: 4/28/2025HYDRAULICCALCULATIONS\WORKING\WET SYSTEM INCLUDING BFP.SDF
JOB TITLE:

PIPE TAG / END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) FL/FT		LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 15					-273.4	2.469	PL	20.22	PF	5.1
22	17.0	0.0	26.1	0.0	18.3	120	FTG	----	PE	0.0
23	17.0	0.0	31.3	0.0		0.254	TL	20.22	PV	
Pipe: 16					-273.4	3.068	PL	30.00	PF	3.3
23	17.0	0.0	31.3	0.0	11.9	120	FTG	E	PE	0.0
24	17.0	0.0	34.5	0.0		0.088	TL	37.00	PV	
Pipe: 17					-273.4	4.026	PL	24.82	PF	0.8
24	17.0	0.0	34.5	0.0	6.9	120	FTG	E	PE	0.0
25	17.0	0.0	35.3	0.0		0.023	TL	34.82	PV	
Pipe: 18					-273.4	4.026	PL	5.00	PF	0.4
25	17.0	0.0	35.3	0.0	6.9	120	FTG	E	PE	0.0
26	17.0	0.0	35.7	0.0		0.023	TL	15.00	PV	
Pipe: 19					273.4	4.026	PL	15.00	PF	1.4
27	2.0	0.0	43.6	0.0	6.9	120	FTG	TCG	PE	-6.5
26	17.0	0.0	35.7	0.0		0.023	TL	59.00	PV	
Pipe: 20					-273.4	7.981	PL	2.00	PF	0.0
27	2.0	0.0	43.6	0.0	1.8	120	FTG	E	PE	0.0
28	2.0	0.0	43.6	0.0		0.001	TL	20.00	PV	
Pipe: 21					-273.4	7.981	PL	2.00	PF	0.0
28	2.0	0.0	43.6	0.0	1.8	120	FTG	E	PE	0.9
29	0.0	0.0	44.5	0.0		0.001	TL	20.00	PV	
Pipe: 22					-273.4	7.981	PL	2.00	PF	0.0
29	0.0	0.0	44.5	0.0	1.8	120	FTG	----	PE	0.0
BFP-OUT	0.0	0.0	44.5	0.0		0.001	TL	2.00	PV	
Pipe: 23					FIXED PRESSURE LOSS DEVICE					
BFP-IN	0.0	0.0	49.5	0.0	5.0 psi, 273.4 gpm					
BFP-OUT	0.0	0.0	44.5	0.0						
Pipe: 24					-273.4	7.981	PL	3.00	PF	0.0
BFP-IN	0.0	0.0	49.5	0.0	1.8	120	FTG	----	PE	0.0
30	0.0	0.0	49.5	0.0		0.001	TL	3.00	PV	
Pipe: 25					-273.4	7.981	PL	5.00	PF	0.0
30	0.0	0.0	49.5	0.0	1.8	120	FTG	E	PE	0.0
31	0.0	0.0	49.5	0.0		0.001	TL	23.00	PV	
Pipe: 26					-273.5	7.981	PL	82.00	PF	0.1
31	0.0	0.0	49.5	0.0	1.8	120	FTG	----	PE	2.2
SRC	-5.0	SRCE	51.7	(N/A)		0.001	TL	82.00	PV	

NOTES (HASS):

(1) Calculations were performed by the HASS computer program
in accordance with NFPA (2020)
under license no. 65699794 granted by
HRS Systems, Inc.
208 Southside Square
Petersburg, TN 37144
(931) 659-9760

(2) The system has been calculated to provide an average imbalance at each node of 0.007 gpm and a maximum imbalance at any node of 0.194 gpm.

(3) Total pressure at each node is used in balancing the system. Maximum water velocity is 18.8 ft/sec at pipe 11.

(4) Items listed in bold print on the cover sheet

are automatically transferred from the calculation report.

(5) Available pressure at source node SRC under full flow conditions is 59.58 psi with a flow of 302.13 gpm.

(6) PIPE FITTINGS TABLE

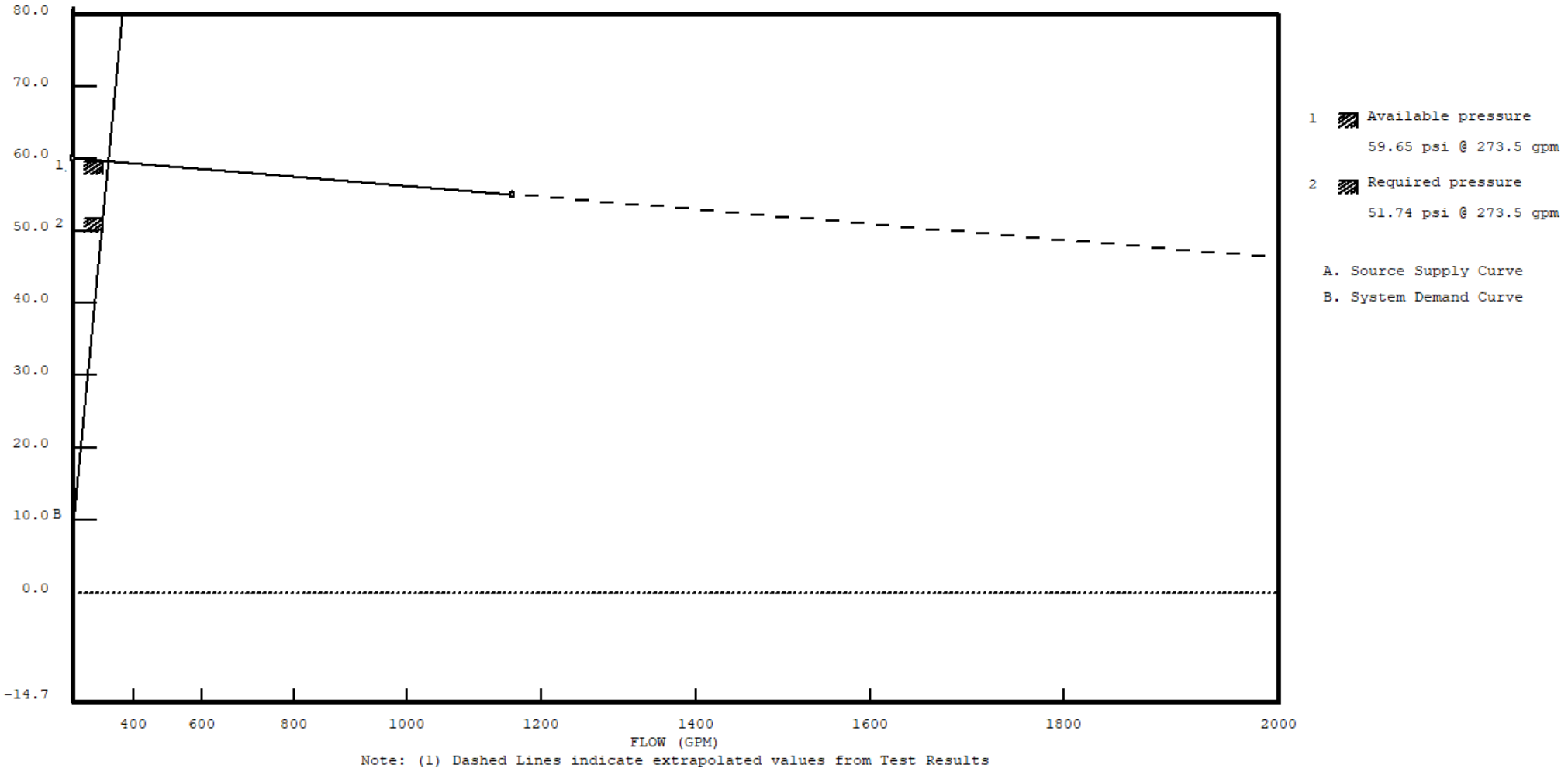
HASS Pipe Table Name: standard

PAGE: A MATERIAL: S40 HWC: 120

Diameter (in)	Equivalent Fitting Lengths in Feet								
	E Ell	T Tee	L LngEll	C ChkVlv	B BfyVlv	G GatVlv	A AlmChk	D DPVlv	N NTee
	F F45Ell								
1.049	2.00 1.00	5.00	2.00	5.00	6.00	1.00	10.00	2.00	5.00
1.610	4.00 2.00	8.00	2.00	9.00	6.00	1.00	10.00	10.00	8.00
2.067	5.00 2.50	10.00	3.00	11.00	6.00	1.00	10.00	10.00	10.00
2.469	6.00 3.00	12.00	4.00	14.00	7.00	1.00	10.00	10.00	12.00
3.068	7.00 3.50	15.00	5.00	16.00	10.00	1.00	13.00	13.00	15.00
4.026	10.00 5.00	20.00	6.00	22.00	12.00	2.00	20.00	20.00	20.00
7.981	18.00 9.00	35.00	13.00	45.00	12.00	4.00	31.00	31.00	35.00

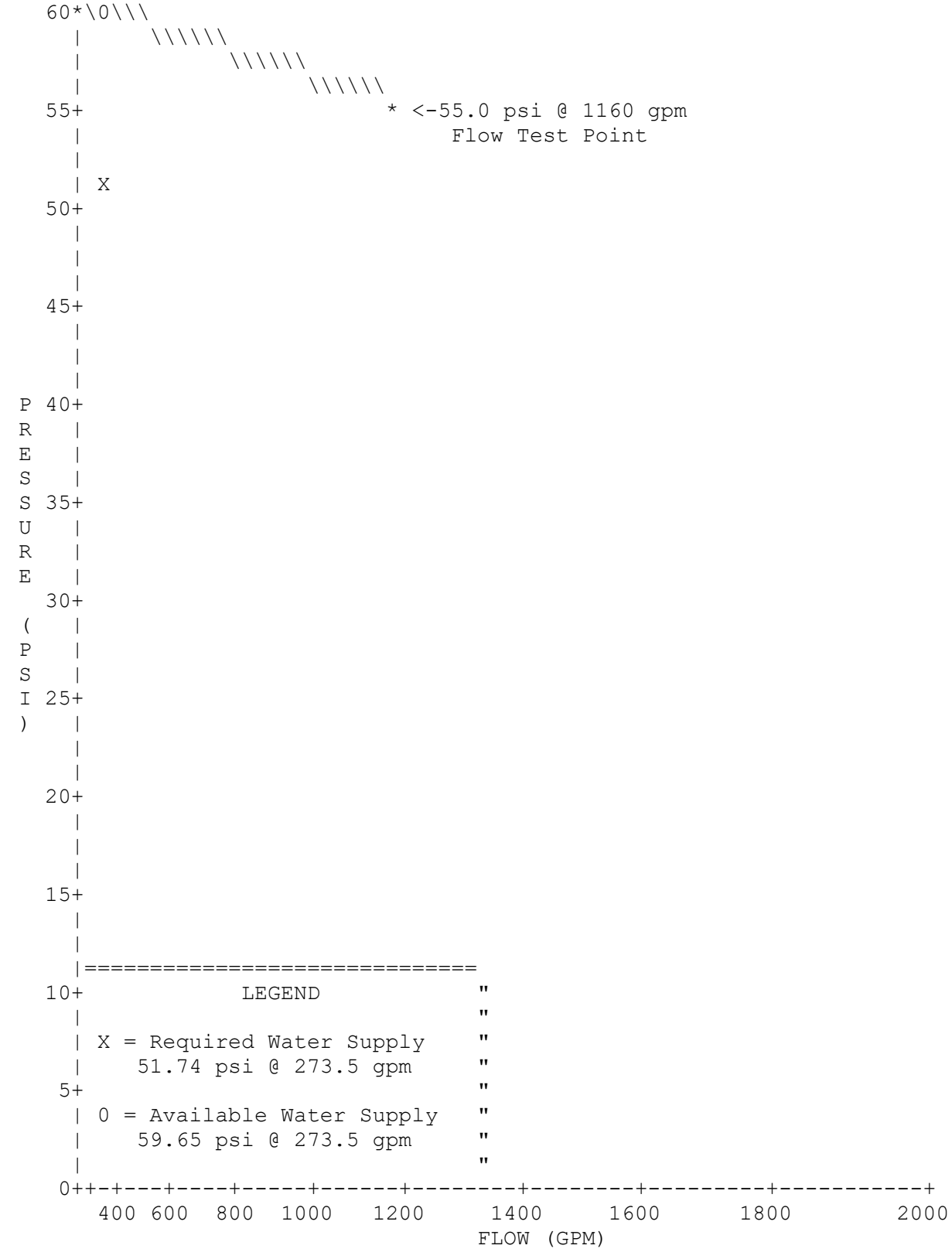
WATER SUPPLY ANALYSIS

Static: 60.00 psi Resid: 55.00 psi Flow: 1160.0 gpm



Note: (1) Dashed Lines indicate extrapolated values from Test Results

WATER SUPPLY CURVE



Hydraulic Calculations

Project Name: TENANT - FIRE STATION 209 & 210

DESIGN DATA:

Remote Area Location: Attic Floor

System Type: Dry System

Hazard: Ordinary Hazard Group-1

Design Density: 0.15 gpm/ sq. ft

Remote Area: Maximum 1950 SQ. FT (1500 sq.ft times 1.3)

Sprinkler Classification: Quick Response Upright

Maximum Sprinkler Coverage: 130 sq. ft

Sprinkler K-Factor: K5.6

CALCULATING END SPRINKLER FLOW IN REMOTE AREA

Design Density = 0.15 gpm/sq ft

Maximum area covered by one sprinkler = 130 sq. ft

Flow required at end sprinkler = 0.15 x 130 gpm

= 19.5 gpm

CACLULATING END SPRINKLER PRESSURE

Using equation.

$Q = K \times \sqrt{P}$

Where, Q = Flow in gpm (gallons per minute)
K = Sprinkler constant given by manufacture data sheet
P = Pressure at sprinkler in psi (pound per square inch)

Once the flow (Q) is calculated, the required pressure (P) can be calculated by simply rearranging the above formula:

$P = (\frac{Q}{k})^2$

Q = 19.5 gpm

K = 5.6

Therefore, Pressure required at end sprinkler = (19.5/5.6)^2 = 12.12 psi.

Therefore, our calculation shall start at Pressure P = 12.12 psi.

This pressure shall be inserted into hydraulic calculation software of minimum end conditions.

DATE: 4/28/20254.HYDRAULICCALCULATIONS\WORKING\DRY SYSTEM WITHOUT BFP.SDF
JOB TITLE:

WATER SUPPLY DATA

SOURCE NODE TAG	STATIC PRESS. (PSI)	RESID. PRESS. (PSI)	@ FLOW (GPM)	AVAIL. PRESS. (PSI)	@ TOTAL DEMAND (GPM)	REQ'D PRESS. (PSI)
SRC	60.0	55.0	1160.0	59.4	355.0	56.8

AGGREGATE FLOW ANALYSIS:

TOTAL FLOW AT SOURCE	355.0 GPM
TOTAL HOSE STREAM ALLOWANCE AT SOURCE	0.0 GPM
OTHER HOSE STREAM ALLOWANCES	0.0 GPM
TOTAL DISCHARGE FROM ACTIVE SPRINKLERS	355.0 GPM

NODE ANALYSIS DATA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)
S1	32.0	K= 5.60	15.9	22.4
S2	32.0	K= 5.60	18.2	23.9
S3	32.0	K= 5.60	19.6	24.8
S4	32.0	K= 5.60	19.7	24.8
S5	32.0	K= 5.60	16.6	22.8
S6	32.0	K= 5.60	18.5	24.1
S7	32.0	K= 5.60	12.1	19.5
S8	32.0	K= 5.60	13.9	20.8
S9	32.0	K= 5.60	19.3	24.6
S10	32.0	K= 5.60	16.8	22.9
S11	32.0	K= 5.60	18.7	24.2
S12	32.0	K= 5.60	18.1	23.9
S13	32.0	K= 5.60	20.7	25.5
S14	32.0	K= 5.60	20.9	25.6
S15	32.0	K= 5.60	20.3	25.2
20	32.0	- - - -	20.8	- - -
21	32.0	- - - -	20.3	- - -
22	32.0	- - - -	20.1	- - -
23	32.0	- - - -	20.1	- - -
24	32.0	- - - -	20.2	- - -
25	32.0	- - - -	20.3	- - -
26	32.0	- - - -	20.4	- - -
27	32.0	- - - -	20.7	- - -
28	32.0	- - - -	22.2	- - -
29	32.0	- - - -	22.8	- - -
30	32.0	- - - -	23.6	- - -
31	32.0	- - - -	24.2	- - -
32	32.0	- - - -	25.6	- - -
33	32.0	- - - -	26.7	- - -
34	32.0	- - - -	27.5	- - -
35	32.0	- - - -	28.3	- - -
36	32.0	- - - -	28.9	- - -
37	32.0	- - - -	22.8	- - -
38	32.0	- - - -	21.7	- - -
39	32.0	- - - -	21.3	- - -
40	32.0	- - - -	30.4	- - -
41	2.0	- - - -	53.5	- - -
42	2.0	- - - -	53.6	- - -
43	2.0	- - - -	53.6	- - -
44	0.0	- - - -	54.5	- - -
45	0.0	- - - -	54.5	- - -

DATE: 4/28/20254.HYDRAULICCALCULATIONS\WORKING\DRY SYSTEM WITHOUT BFP.SDF
JOB TITLE:

NODE ANALYSIS DATA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)
46	-5.0	- - - -	56.7	- - -
SRC	-5.0	SOURCE	56.8	355.0

PIPE DATA

PIPE TAG / END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) FL/FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 1					-22.4	1.049 PL	10.00	PF	2.2
S1	32.0	5.6	15.9	22.4	8.3	100 FTG	----	PE	0.0
S2	32.0	5.6	18.2	23.9		0.224 TL	10.00	PV	
Pipe: 2					-46.2	1.049 PL	3.00	PF	2.6
S2	32.0	5.6	18.2	23.9	17.2	100 FTG	----	PE	0.0
27	32.0	0.0	20.7	0.0		0.859 TL	3.00	PV	
Pipe: 3					-24.8	1.049 PL	3.00	PF	0.8
S3	32.0	5.6	19.6	24.8	9.2	100 FTG	----	PE	0.0
26	32.0	0.0	20.4	0.0		0.271 TL	3.00	PV	
Pipe: 4					-24.8	1.049 PL	1.80	PF	0.5
S4	32.0	5.6	19.7	24.8	9.2	100 FTG	----	PE	0.0
24	32.0	0.0	20.2	0.0		0.272 TL	1.80	PV	
Pipe: 5					-22.8	1.049 PL	8.20	PF	1.9
S5	32.0	5.6	16.6	22.8	8.5	100 FTG	----	PE	0.0
S6	32.0	5.6	18.5	24.1		0.233 TL	8.20	PV	
Pipe: 6					-46.9	1.049 PL	1.80	PF	1.6
S6	32.0	5.6	18.5	24.1	17.4	100 FTG	----	PE	0.0
23	32.0	0.0	20.1	0.0		0.883 TL	1.80	PV	
Pipe: 7					-19.5	1.049 PL	10.00	PF	1.7
S7	32.0	5.6	12.1	19.5	7.2	100 FTG	----	PE	0.0
S8	32.0	5.6	13.9	20.8		0.174 TL	10.00	PV	
Pipe: 8					-40.3	1.049 PL	8.20	PF	5.5
S8	32.0	5.6	13.9	20.8	15.0	100 FTG	----	PE	0.0
S9	32.0	5.6	19.3	24.6		0.668 TL	8.20	PV	
Pipe: 9					-65.0	1.380 PL	1.80	PF	0.8
S9	32.0	5.6	19.3	24.6	13.9	100 FTG	----	PE	0.0
22	32.0	0.0	20.1	0.0		0.424 TL	1.80	PV	
Pipe: 10					-22.9	1.049 PL	8.20	PF	1.9
S10	32.0	5.6	16.8	22.9	8.5	100 FTG	----	PE	0.0
S11	32.0	5.6	18.7	24.2		0.235 TL	8.20	PV	
Pipe: 11					-47.1	1.049 PL	1.80	PF	1.6
S11	32.0	5.6	18.7	24.2	17.5	100 FTG	----	PE	0.0
21	32.0	0.0	20.3	0.0		0.891 TL	1.80	PV	
Pipe: 12					-23.9	1.049 PL	10.00	PF	2.5
S12	32.0	5.6	18.1	23.9	8.9	100 FTG	----	PE	0.0
S13	32.0	5.6	20.7	25.5		0.253 TL	10.00	PV	
Pipe: 13					-49.3	1.049 PL	2.20	PF	2.1
S13	32.0	5.6	20.7	25.5	18.3	100 FTG	----	PE	0.0
37	32.0	0.0	22.8	0.0		0.968 TL	2.20	PV	
Pipe: 14					-25.6	1.049 PL	3.00	PF	0.9
S14	32.0	5.6	20.9	25.6	9.5	100 FTG	----	PE	0.0
38	32.0	0.0	21.7	0.0		0.288 TL	3.00	PV	

DATE: 4/28/20254.HYDRAULICCALCULATIONS\WORKING\DRY SYSTEM WITHOUT BFP.SDF
JOB TITLE:

PIPE TAG / END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) FL/FT		LENGTH (FT)		PRESS. SUM. (PSI)	
Pipe: 15					-25.2	1.049	PL	1.80	PF		0.5
S15	32.0	5.6	20.3	25.2	9.4	100	FTG	----	PE		0.0
20	32.0	0.0	20.8	0.0		0.281	TL	1.80	PV		
Pipe: 16					116.8	3.068	PL	10.00	PF		0.5
20	32.0	0.0	20.8	0.0	5.1	100	FTG	T	PE		0.0
21	32.0	0.0	20.3	0.0		0.026	TL	20.71	PV		
Pipe: 17					69.6	3.068	PL	10.00	PF		0.2
21	32.0	0.0	20.3	0.0	3.0	100	FTG	T	PE		0.0
22	32.0	0.0	20.1	0.0		0.010	TL	20.71	PV		
Pipe: 18					4.6	3.068	PL	10.00	PF		0.0
22	32.0	0.0	20.1	0.0	0.2	100	FTG	T	PE		0.0
23	32.0	0.0	20.1	0.0		0.000	TL	20.71	PV		
Pipe: 19					-42.3	3.068	PL	10.00	PF		0.1
23	32.0	0.0	20.1	0.0	1.8	100	FTG	T	PE		0.0
24	32.0	0.0	20.2	0.0		0.004	TL	20.71	PV		
Pipe: 20					-67.1	3.068	PL	3.00	PF		0.1
24	32.0	0.0	20.2	0.0	2.9	100	FTG	E	PE		0.0
25	32.0	0.0	20.3	0.0		0.009	TL	8.00	PV		
Pipe: 21					-67.1	3.068	PL	6.25	PF		0.2
25	32.0	0.0	20.3	0.0	2.9	100	FTG	T	PE		0.0
26	32.0	0.0	20.4	0.0		0.009	TL	16.96	PV		
Pipe: 22					-91.9	3.068	PL	10.00	PF		0.3
26	32.0	0.0	20.4	0.0	4.0	100	FTG	T	PE		0.0
27	32.0	0.0	20.7	0.0		0.016	TL	20.71	PV		
Pipe: 23					-138.1	3.068	PL	36.00	PF		1.4
27	32.0	0.0	20.7	0.0	6.0	100	FTG	E	PE		0.0
28	32.0	0.0	22.2	0.0		0.035	TL	41.00	PV		
Pipe: 24					-138.1	3.068	PL	12.50	PF		0.6
28	32.0	0.0	22.2	0.0	6.0	100	FTG	E	PE		0.0
29	32.0	0.0	22.8	0.0		0.035	TL	17.50	PV		
Pipe: 25					-138.1	3.068	PL	17.22	PF		0.8
29	32.0	0.0	22.8	0.0	6.0	100	FTG	E	PE		0.0
30	32.0	0.0	23.6	0.0		0.035	TL	22.22	PV		
Pipe: 26					-138.1	3.068	PL	12.50	PF		0.6
30	32.0	0.0	23.6	0.0	6.0	100	FTG	E	PE		0.0
31	32.0	0.0	24.2	0.0		0.035	TL	17.50	PV		
Pipe: 27					-138.1	3.068	PL	35.00	PF		1.4
31	32.0	0.0	24.2	0.0	6.0	100	FTG	E	PE		0.0
32	32.0	0.0	25.6	0.0		0.035	TL	40.00	PV		
Pipe: 28					-138.1	3.068	PL	26.50	PF		1.1
32	32.0	0.0	25.6	0.0	6.0	100	FTG	E	PE		0.0
33	32.0	0.0	26.7	0.0		0.035	TL	31.50	PV		
Pipe: 29					-138.1	3.068	PL	18.30	PF		0.8
33	32.0	0.0	26.7	0.0	6.0	100	FTG	E	PE		0.0
34	32.0	0.0	27.5	0.0		0.035	TL	23.30	PV		

PIPE TAG / END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) FL/FT		LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 30					-138.1	3.068	PL	18.85	PF	0.8
34	32.0	0.0	27.5	0.0	6.0	100	FTG	E	PE	0.0
35	32.0	0.0	28.3	0.0		0.035	TL	23.85	PV	
Pipe: 31					-138.1	3.068	PL	5.10	PF	0.6
35	32.0	0.0	28.3	0.0	6.0	100	FTG	T	PE	0.0
36	32.0	0.0	28.9	0.0		0.035	TL	15.81	PV	
Pipe: 32					216.9	3.068	PL	64.77	PF	6.1
36	32.0	0.0	28.9	0.0	9.4	100	FTG	T	PE	0.0
37	32.0	0.0	22.8	0.0		0.081	TL	75.48	PV	
Pipe: 33					167.6	3.068	PL	11.00	PF	1.0
37	32.0	0.0	22.8	0.0	7.3	100	FTG	2E	PE	0.0
38	32.0	0.0	21.7	0.0		0.050	TL	20.99	PV	
Pipe: 34					142.0	3.068	PL	6.25	PF	0.4
38	32.0	0.0	21.7	0.0	6.2	100	FTG	E	PE	0.0
39	32.0	0.0	21.3	0.0		0.037	TL	11.25	PV	
Pipe: 35					142.0	3.068	PL	3.00	PF	0.5
39	32.0	0.0	21.3	0.0	6.2	100	FTG	T	PE	0.0
20	32.0	0.0	20.8	0.0		0.037	TL	13.71	PV	
Pipe: 36					-355.0	3.068	PL	2.50	PF	1.5
36	32.0	0.0	28.9	0.0	15.4	100	FTG	E	PE	0.0
40	32.0	0.0	30.4	0.0		0.200	TL	7.50	PV	
Pipe: 37					355.0	3.068	PL	30.00	PF	10.2
41	2.0	0.0	53.5	0.0	15.4	100	FTG	TGD	PE	-13.0
40	32.0	0.0	30.4	0.0		0.200	TL	50.70	PV	
Pipe: 38					-355.0	7.981	PL	6.00	PF	0.0
41	2.0	0.0	53.5	0.0	2.3	120	FTG	----	PE	0.0
42	2.0	0.0	53.6	0.0		0.001	TL	6.00	PV	
Pipe: 39					-355.0	7.981	PL	2.00	PF	0.0
42	2.0	0.0	53.6	0.0	2.3	120	FTG	E	PE	0.0
43	2.0	0.0	53.6	0.0		0.001	TL	20.00	PV	
Pipe: 40					-355.0	7.981	PL	2.00	PF	0.0
43	2.0	0.0	53.6	0.0	2.3	120	FTG	E	PE	0.9
44	0.0	0.0	54.5	0.0		0.001	TL	20.00	PV	
Pipe: 41					-355.0	7.981	PL	7.00	PF	0.0
44	0.0	0.0	54.5	0.0	2.3	120	FTG	E	PE	0.0
45	0.0	0.0	54.5	0.0		0.001	TL	25.00	PV	
Pipe: 42					-355.0	7.981	PL	5.00	PF	0.0
45	0.0	0.0	54.5	0.0	2.3	120	FTG	E	PE	2.2
46	-5.0	0.0	56.7	0.0		0.001	TL	23.00	PV	
Pipe: 43					-355.0	7.981	PL	82.00	PF	0.1
46	-5.0	0.0	56.7	0.0	2.3	120	FTG	----	PE	0.0
SRC	-5.0	SRCE	56.8	(N/A)		0.001	TL	82.00	PV	

DATE: 4/28/20254.HYDRAULICCALCULATIONS\WORKING\DRY SYSTEM WITHOUT BFP.SDF
JOB TITLE:

NOTES (HASS):

(1) Calculations were performed by the HASS computer program in accordance with NFPA (2020) under license no. 65699794 granted by

HRS Systems, Inc.
208 Southside Square
Petersburg, TN 37144
(931) 659-9760

(2) The system has been calculated to provide an average imbalance at each node of 0.001 gpm and a maximum imbalance at any node of 0.061 gpm.

(3) Total pressure at each node is used in balancing the system. Maximum water velocity is 18.3 ft/sec at pipe 13.

(4) Items listed in bold print on the cover sheet

are automatically transferred from the calculation report.

(5) Available pressure at source node SRC under full flow conditions is 59.41 psi with a flow of 366.66 gpm.

(6) PIPE FITTINGS TABLE

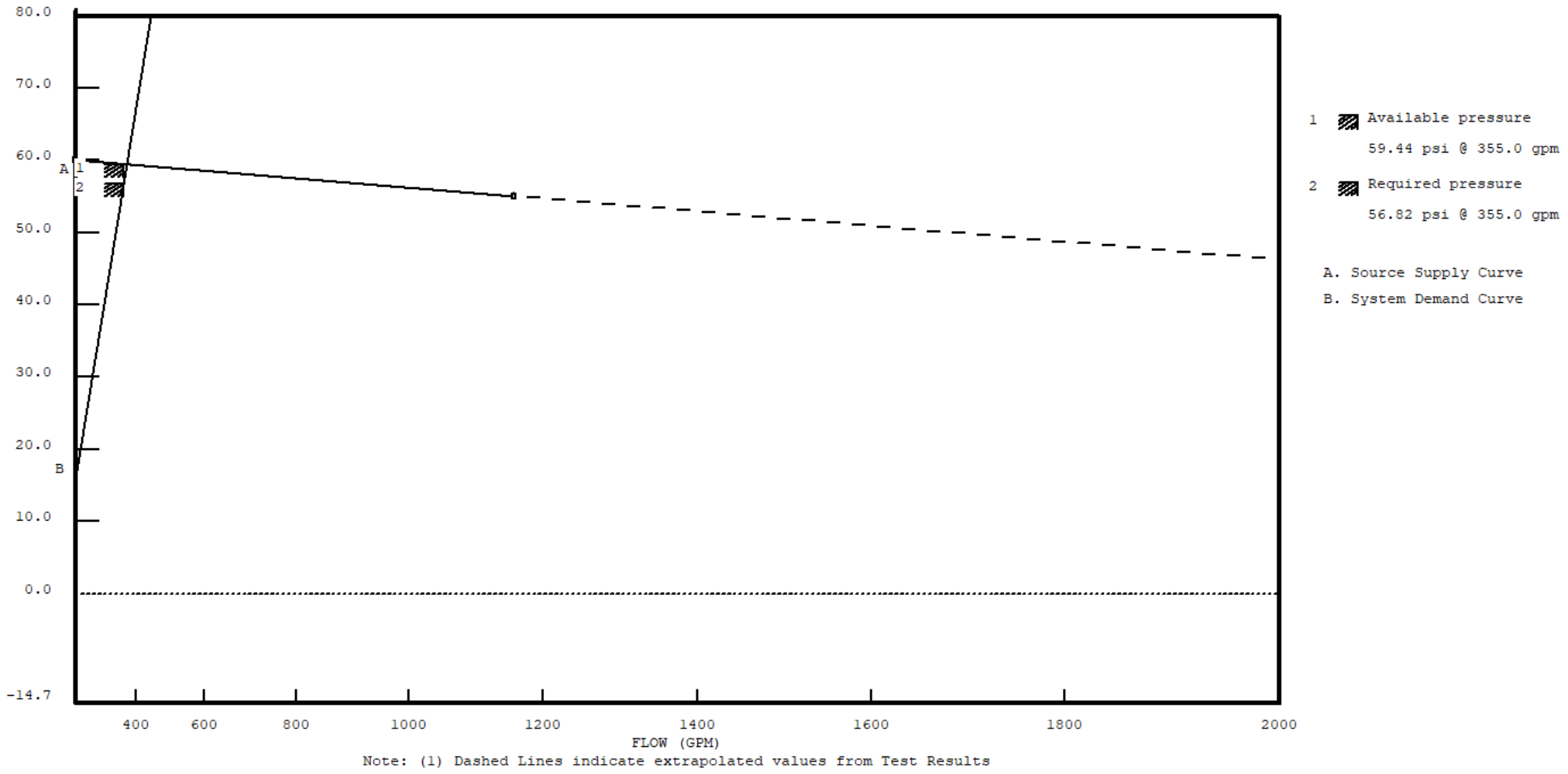
HASS Pipe Table Name: standard

PAGE: A MATERIAL: S40 HWC: 120

Diameter (in)	Equivalent Fitting Lengths in Feet								
	E Ell	T Tee	L LngEll	C ChkVlv	B BfyVlv	G GatVlv	A AlmChk	D DPVlv	N NTee
	F F45Ell								
1.049	2.00 1.00	5.00	2.00	5.00	6.00	1.00	10.00	2.00	5.00
1.380	3.00 1.50	6.00	2.00	7.00	6.00	1.00	10.00	10.00	6.00
3.068	7.00 3.50	15.00	5.00	16.00	10.00	1.00	13.00	13.00	15.00
7.981	18.00 9.00	35.00	13.00	45.00	12.00	4.00	31.00	31.00	35.00

WATER SUPPLY ANALYSIS

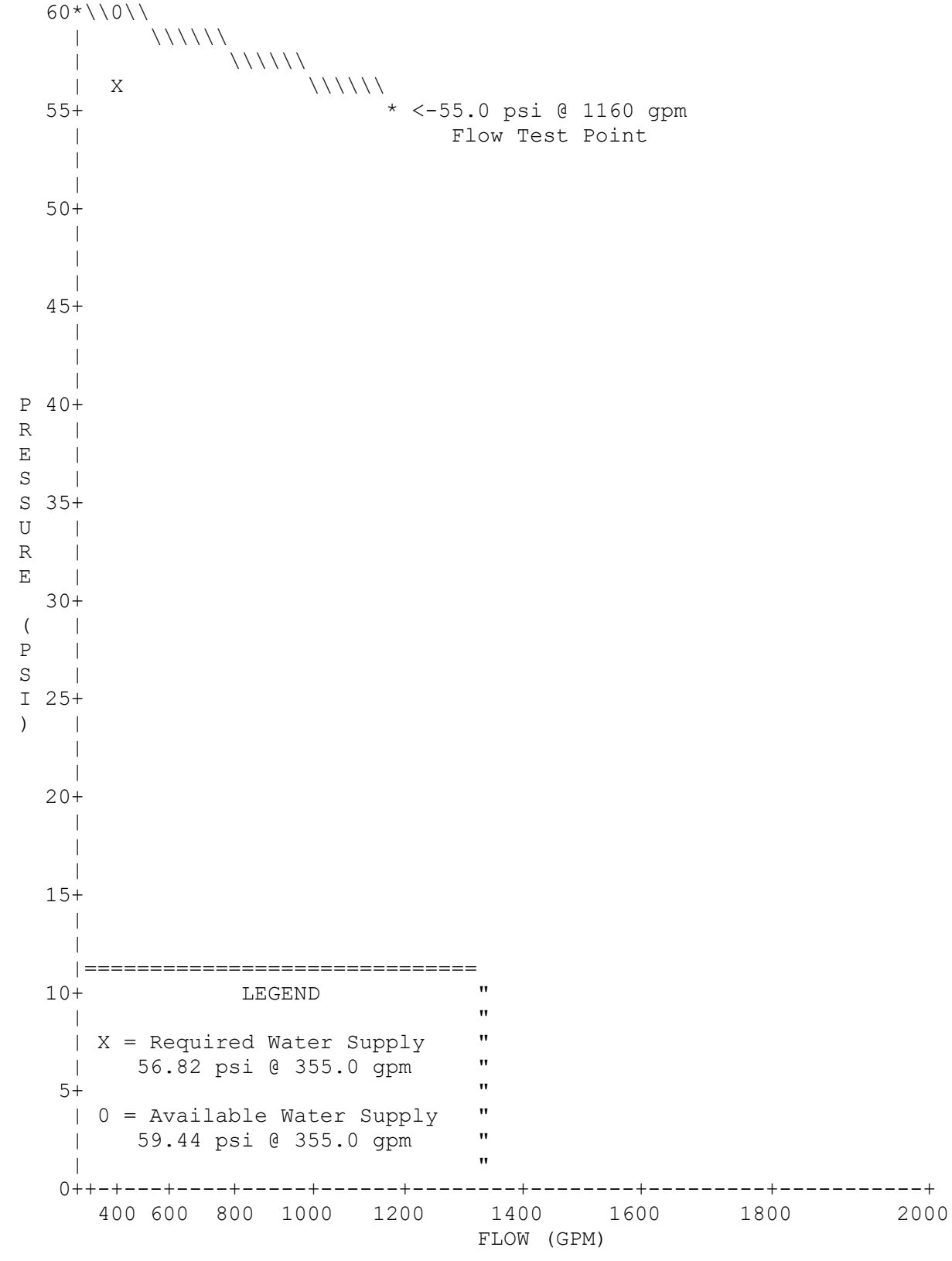
Static: 60.00 psi Resid: 55.00 psi Flow: 1160.0 gpm



Note: (1) Dashed Lines indicate extrapolated values from Test Results

DATE: 4/28/20254.HYDRAULICCALCULATIONS\WORKING\DRY SYSTEM WITHOUT BFP.SDF
JOB TITLE:

WATER SUPPLY CURVE



DATE: 4/28/2025HYDRAULICCALCULATIONS\WORKING\DRY SYSTEM INCLUDING BFP.SDF
JOB TITLE:

WATER SUPPLY DATA

SOURCE NODE TAG	STATIC PRESS. (PSI)	RESID. PRESS. (PSI)	@ FLOW (GPM)	AVAIL. PRESS. (PSI)	@ TOTAL DEMAND (GPM)	REQ'D PRESS. (PSI)
SRC	60.0	55.0	1160.0	59.4	355.0	61.8

AGGREGATE FLOW ANALYSIS:

TOTAL FLOW AT SOURCE	355.0 GPM
TOTAL HOSE STREAM ALLOWANCE AT SOURCE	0.0 GPM
OTHER HOSE STREAM ALLOWANCES	0.0 GPM
TOTAL DISCHARGE FROM ACTIVE SPRINKLERS	355.0 GPM

NODE ANALYSIS DATA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)
S1	32.0	K= 5.60	15.9	22.4
S2	32.0	K= 5.60	18.2	23.9
S3	32.0	K= 5.60	19.6	24.8
S4	32.0	K= 5.60	19.7	24.8
S5	32.0	K= 5.60	16.6	22.8
S6	32.0	K= 5.60	18.5	24.1
S7	32.0	K= 5.60	12.1	19.5
S8	32.0	K= 5.60	13.9	20.8
S9	32.0	K= 5.60	19.3	24.6
S10	32.0	K= 5.60	16.8	22.9
S11	32.0	K= 5.60	18.7	24.2
S12	32.0	K= 5.60	18.1	23.9
S13	32.0	K= 5.60	20.7	25.5
S14	32.0	K= 5.60	20.9	25.6
S15	32.0	K= 5.60	20.3	25.2
20	32.0	- - - -	20.8	- - -
21	32.0	- - - -	20.3	- - -
22	32.0	- - - -	20.1	- - -
23	32.0	- - - -	20.1	- - -
24	32.0	- - - -	20.2	- - -
25	32.0	- - - -	20.3	- - -
26	32.0	- - - -	20.4	- - -
27	32.0	- - - -	20.7	- - -
28	32.0	- - - -	22.2	- - -
29	32.0	- - - -	22.8	- - -
30	32.0	- - - -	23.6	- - -
31	32.0	- - - -	24.2	- - -
32	32.0	- - - -	25.6	- - -
33	32.0	- - - -	26.7	- - -
34	32.0	- - - -	27.5	- - -
35	32.0	- - - -	28.3	- - -
36	32.0	- - - -	28.9	- - -
37	32.0	- - - -	22.8	- - -
38	32.0	- - - -	21.7	- - -
39	32.0	- - - -	21.3	- - -
40	32.0	- - - -	30.4	- - -
41	2.0	- - - -	53.5	- - -
42	2.0	- - - -	53.6	- - -
43	2.0	- - - -	53.6	- - -
44	0.0	- - - -	54.5	- - -
BFP-OUT	0.0	- - - -	54.5	- - -

DATE: 4/28/2025HYDRAULICCALCULATIONS\WORKING\DRY SYSTEM INCLUDING BFP.SDF
JOB TITLE:

NODE ANALYSIS DATA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)
BFP-IN	0.0	- - - -	59.5	- - -
45	0.0	- - - -	59.5	- - -
46	-5.0	- - - -	61.7	- - -
SRC	-5.0	SOURCE	61.8	355.0

PIPE DATA

PIPE TAG / END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) FL/FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 1					-22.4	1.049 PL	10.00	PF	2.2
S1	32.0	5.6	15.9	22.4	8.3	100 FTG	----	PE	0.0
S2	32.0	5.6	18.2	23.9		0.224 TL	10.00	PV	
Pipe: 2					-46.2	1.049 PL	3.00	PF	2.6
S2	32.0	5.6	18.2	23.9	17.2	100 FTG	----	PE	0.0
27	32.0	0.0	20.7	0.0		0.859 TL	3.00	PV	
Pipe: 3					-24.8	1.049 PL	3.00	PF	0.8
S3	32.0	5.6	19.6	24.8	9.2	100 FTG	----	PE	0.0
26	32.0	0.0	20.4	0.0		0.271 TL	3.00	PV	
Pipe: 4					-24.8	1.049 PL	1.80	PF	0.5
S4	32.0	5.6	19.7	24.8	9.2	100 FTG	----	PE	0.0
24	32.0	0.0	20.2	0.0		0.272 TL	1.80	PV	
Pipe: 5					-22.8	1.049 PL	8.20	PF	1.9
S5	32.0	5.6	16.6	22.8	8.5	100 FTG	----	PE	0.0
S6	32.0	5.6	18.5	24.1		0.233 TL	8.20	PV	
Pipe: 6					-46.9	1.049 PL	1.80	PF	1.6
S6	32.0	5.6	18.5	24.1	17.4	100 FTG	----	PE	0.0
23	32.0	0.0	20.1	0.0		0.883 TL	1.80	PV	
Pipe: 7					-19.5	1.049 PL	10.00	PF	1.7
S7	32.0	5.6	12.1	19.5	7.2	100 FTG	----	PE	0.0
S8	32.0	5.6	13.9	20.8		0.174 TL	10.00	PV	
Pipe: 8					-40.3	1.049 PL	8.20	PF	5.5
S8	32.0	5.6	13.9	20.8	15.0	100 FTG	----	PE	0.0
S9	32.0	5.6	19.3	24.6		0.668 TL	8.20	PV	
Pipe: 9					-65.0	1.380 PL	1.80	PF	0.8
S9	32.0	5.6	19.3	24.6	13.9	100 FTG	----	PE	0.0
22	32.0	0.0	20.1	0.0		0.424 TL	1.80	PV	
Pipe: 10					-22.9	1.049 PL	8.20	PF	1.9
S10	32.0	5.6	16.8	22.9	8.5	100 FTG	----	PE	0.0
S11	32.0	5.6	18.7	24.2		0.235 TL	8.20	PV	
Pipe: 11					-47.1	1.049 PL	1.80	PF	1.6
S11	32.0	5.6	18.7	24.2	17.5	100 FTG	----	PE	0.0
21	32.0	0.0	20.3	0.0		0.891 TL	1.80	PV	
Pipe: 12					-23.9	1.049 PL	10.00	PF	2.5
S12	32.0	5.6	18.1	23.9	8.9	100 FTG	----	PE	0.0
S13	32.0	5.6	20.7	25.5		0.253 TL	10.00	PV	
Pipe: 13					-49.3	1.049 PL	2.20	PF	2.1
S13	32.0	5.6	20.7	25.5	18.3	100 FTG	----	PE	0.0
37	32.0	0.0	22.8	0.0		0.968 TL	2.20	PV	
Pipe: 14					-25.6	1.049 PL	3.00	PF	0.9
S14	32.0	5.6	20.9	25.6	9.5	100 FTG	----	PE	0.0
38	32.0	0.0	21.7	0.0		0.288 TL	3.00	PV	

DATE: 4/28/2025HYDRAULICCALCULATIONS\WORKING\DRY SYSTEM INCLUDING BFP.SDF
JOB TITLE:

PIPE TAG / END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) FL/FT		LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 15					-25.2	1.049	PL	1.80	PF	0.5
S15	32.0	5.6	20.3	25.2	9.4	100	FTG	----	PE	0.0
20	32.0	0.0	20.8	0.0		0.281	TL	1.80	PV	
Pipe: 16					116.8	3.068	PL	10.00	PF	0.5
20	32.0	0.0	20.8	0.0	5.1	100	FTG	T	PE	0.0
21	32.0	0.0	20.3	0.0		0.026	TL	20.71	PV	
Pipe: 17					69.6	3.068	PL	10.00	PF	0.2
21	32.0	0.0	20.3	0.0	3.0	100	FTG	T	PE	0.0
22	32.0	0.0	20.1	0.0		0.010	TL	20.71	PV	
Pipe: 18					4.6	3.068	PL	10.00	PF	0.0
22	32.0	0.0	20.1	0.0	0.2	100	FTG	T	PE	0.0
23	32.0	0.0	20.1	0.0		0.000	TL	20.71	PV	
Pipe: 19					-42.3	3.068	PL	10.00	PF	0.1
23	32.0	0.0	20.1	0.0	1.8	100	FTG	T	PE	0.0
24	32.0	0.0	20.2	0.0		0.004	TL	20.71	PV	
Pipe: 20					-67.1	3.068	PL	3.00	PF	0.1
24	32.0	0.0	20.2	0.0	2.9	100	FTG	E	PE	0.0
25	32.0	0.0	20.3	0.0		0.009	TL	8.00	PV	
Pipe: 21					-67.1	3.068	PL	6.25	PF	0.2
25	32.0	0.0	20.3	0.0	2.9	100	FTG	T	PE	0.0
26	32.0	0.0	20.4	0.0		0.009	TL	16.96	PV	
Pipe: 22					-91.9	3.068	PL	10.00	PF	0.3
26	32.0	0.0	20.4	0.0	4.0	100	FTG	T	PE	0.0
27	32.0	0.0	20.7	0.0		0.016	TL	20.71	PV	
Pipe: 23					-138.1	3.068	PL	36.00	PF	1.4
27	32.0	0.0	20.7	0.0	6.0	100	FTG	E	PE	0.0
28	32.0	0.0	22.2	0.0		0.035	TL	41.00	PV	
Pipe: 24					-138.1	3.068	PL	12.50	PF	0.6
28	32.0	0.0	22.2	0.0	6.0	100	FTG	E	PE	0.0
29	32.0	0.0	22.8	0.0		0.035	TL	17.50	PV	
Pipe: 25					-138.1	3.068	PL	17.22	PF	0.8
29	32.0	0.0	22.8	0.0	6.0	100	FTG	E	PE	0.0
30	32.0	0.0	23.6	0.0		0.035	TL	22.22	PV	
Pipe: 26					-138.1	3.068	PL	12.50	PF	0.6
30	32.0	0.0	23.6	0.0	6.0	100	FTG	E	PE	0.0
31	32.0	0.0	24.2	0.0		0.035	TL	17.50	PV	
Pipe: 27					-138.1	3.068	PL	35.00	PF	1.4
31	32.0	0.0	24.2	0.0	6.0	100	FTG	E	PE	0.0
32	32.0	0.0	25.6	0.0		0.035	TL	40.00	PV	
Pipe: 28					-138.1	3.068	PL	26.50	PF	1.1
32	32.0	0.0	25.6	0.0	6.0	100	FTG	E	PE	0.0
33	32.0	0.0	26.7	0.0		0.035	TL	31.50	PV	
Pipe: 29					-138.1	3.068	PL	18.30	PF	0.8
33	32.0	0.0	26.7	0.0	6.0	100	FTG	E	PE	0.0
34	32.0	0.0	27.5	0.0		0.035	TL	23.30	PV	

DATE: 4/28/2025HYDRAULICCALCULATIONS\WORKING\DRY SYSTEM INCLUDING BFP.SDF
JOB TITLE:

PIPE TAG / END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) FL/FT		LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 30					-138.1	3.068	PL	18.85	PF	0.8
34	32.0	0.0	27.5	0.0	6.0	100	FTG	E	PE	0.0
35	32.0	0.0	28.3	0.0		0.035	TL	23.85	PV	
Pipe: 31					-138.1	3.068	PL	5.10	PF	0.6
35	32.0	0.0	28.3	0.0	6.0	100	FTG	T	PE	0.0
36	32.0	0.0	28.9	0.0		0.035	TL	15.81	PV	
Pipe: 32					216.9	3.068	PL	64.77	PF	6.1
36	32.0	0.0	28.9	0.0	9.4	100	FTG	T	PE	0.0
37	32.0	0.0	22.8	0.0		0.081	TL	75.48	PV	
Pipe: 33					167.6	3.068	PL	11.00	PF	1.0
37	32.0	0.0	22.8	0.0	7.3	100	FTG	2E	PE	0.0
38	32.0	0.0	21.7	0.0		0.050	TL	20.99	PV	
Pipe: 34					142.0	3.068	PL	6.25	PF	0.4
38	32.0	0.0	21.7	0.0	6.2	100	FTG	E	PE	0.0
39	32.0	0.0	21.3	0.0		0.037	TL	11.25	PV	
Pipe: 35					142.0	3.068	PL	3.00	PF	0.5
39	32.0	0.0	21.3	0.0	6.2	100	FTG	T	PE	0.0
20	32.0	0.0	20.8	0.0		0.037	TL	13.71	PV	
Pipe: 36					-355.0	3.068	PL	2.50	PF	1.5
36	32.0	0.0	28.9	0.0	15.4	100	FTG	E	PE	0.0
40	32.0	0.0	30.4	0.0		0.200	TL	7.50	PV	
Pipe: 37					355.0	3.068	PL	30.00	PF	10.2
41	2.0	0.0	53.5	0.0	15.4	100	FTG	TGD	PE	-13.0
40	32.0	0.0	30.4	0.0		0.200	TL	50.70	PV	
Pipe: 38					-355.0	7.981	PL	6.00	PF	0.0
41	2.0	0.0	53.5	0.0	2.3	120	FTG	----	PE	0.0
42	2.0	0.0	53.6	0.0		0.001	TL	6.00	PV	
Pipe: 39					-355.0	7.981	PL	2.00	PF	0.0
42	2.0	0.0	53.6	0.0	2.3	120	FTG	E	PE	0.0
43	2.0	0.0	53.6	0.0		0.001	TL	20.00	PV	
Pipe: 40					-355.0	7.981	PL	2.00	PF	0.0
43	2.0	0.0	53.6	0.0	2.3	120	FTG	E	PE	0.9
44	0.0	0.0	54.5	0.0		0.001	TL	20.00	PV	
Pipe: 41					-355.0	7.981	PL	2.00	PF	0.0
44	0.0	0.0	54.5	0.0	2.3	120	FTG	----	PE	0.0
BFP-OUT	0.0	0.0	54.5	0.0		0.001	TL	2.00	PV	
Pipe: 42					FIXED PRESSURE LOSS DEVICE					
BFP-IN	0.0	0.0	59.5	0.0	5.0 psi, 355.0 gpm					
BFP-OUT	0.0	0.0	54.5	0.0						
Pipe: 43					-355.0	7.981	PL	4.00	PF	0.0
BFP-IN	0.0	0.0	59.5	0.0	2.3	120	FTG	E	PE	0.0
45	0.0	0.0	59.5	0.0		0.001	TL	22.00	PV	
Pipe: 44					-355.0	7.981	PL	5.00	PF	0.0
45	0.0	0.0	59.5	0.0	2.3	120	FTG	E	PE	2.2
46	-5.0	0.0	61.7	0.0		0.001	TL	23.00	PV	

PIPE TAG / END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) FL/FT	LENGTH (FT)		PRESS. SUM. (PSI)	
Pipe: 45					-355.0	7.981	PL	82.00	PF	0.1
46	-5.0	0.0	61.7	0.0	2.3	120	FTG	----	PE	0.0
SRC	-5.0	SRCE	61.8	(N/A)		0.001	TL	82.00	PV	

NOTES (HASS):

(1) Calculations were performed by the HASS computer program
in accordance with NFPA (2020)
under license no. 65699794 granted by
HRS Systems, Inc.
208 Southside Square
Petersburg, TN 37144
(931) 659-9760

(2) The system has been calculated to provide an average
imbalance at each node of 0.004 gpm and a maximum
imbalance at any node of 0.171 gpm.

(3) Total pressure at each node is used in balancing the system.
Maximum water velocity is 18.3 ft/sec at pipe 13.

(4) Items listed in bold print on the cover sheet

are automatically transferred from the calculation report.

(5) Available pressure at source node SRC under full flow conditions is
59.47 psi with a flow of 344.24 gpm.

(6) PIPE FITTINGS TABLE

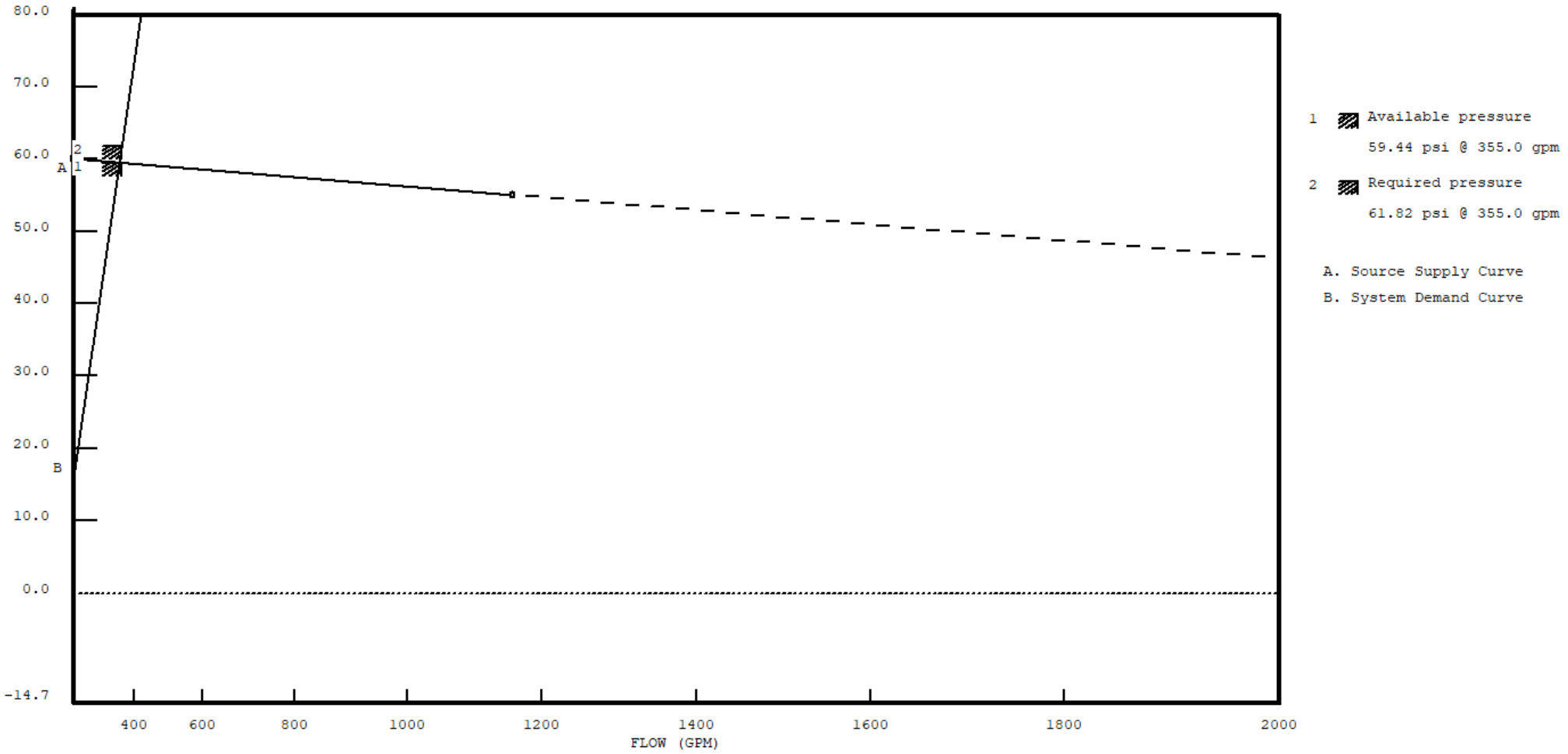
HASS Pipe Table Name: standard

PAGE: A MATERIAL: S40 HWC: 120

Diameter (in)	E 90 Ell	T Tee	L 45 Ell	C ChkVlv	B BfyVlv	G GatVlv	A AlmChk	D DPVlv	N NTee
1.049	2.00	5.00	2.00	5.00	6.00	1.00	10.00	2.00	5.00
	1.00								
1.380	3.00	6.00	2.00	7.00	6.00	1.00	10.00	10.00	6.00
	1.50								
3.068	7.00	15.00	5.00	16.00	10.00	1.00	13.00	13.00	15.00
	3.50								
7.981	18.00	35.00	13.00	45.00	12.00	4.00	31.00	31.00	35.00
	9.00								

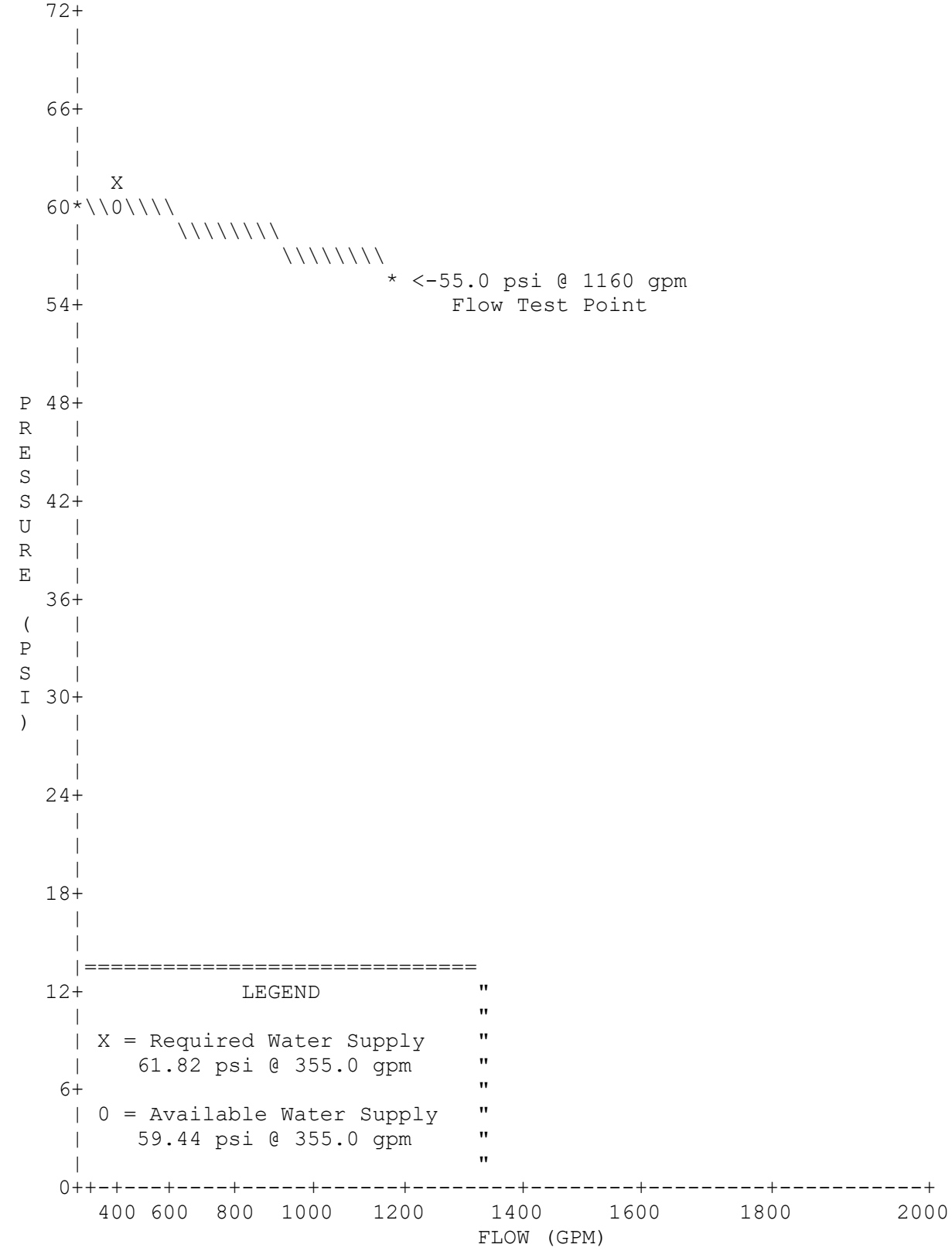
WATER SUPPLY ANALYSIS

Static: 60.00 psi Resid: 55.00 psi Flow: 1160.0 gpm



Note: (1) Dashed Lines indicate extrapolated values from Test Results

WATER SUPPLY CURVE



DATE: 4/28/2025HYDRAULICCALCULATIONS\WORKING\DRY SYSTEM INCLUDING BFP.SDF
JOB TITLE:

Dry System with modified 4" riser

WATER SUPPLY DATA

SOURCE NODE TAG	STATIC PRESS. (PSI)	RESID. PRESS. (PSI)	@ FLOW (GPM)	AVAIL. PRESS. (PSI)	@ TOTAL DEMAND (GPM)	REQ'D PRESS. (PSI)
SRC	60.0	55.0	1160.0	59.4	355.0	53.9

AGGREGATE FLOW ANALYSIS:

TOTAL FLOW AT SOURCE	355.0 GPM
TOTAL HOSE STREAM ALLOWANCE AT SOURCE	0.0 GPM
OTHER HOSE STREAM ALLOWANCES	0.0 GPM
TOTAL DISCHARGE FROM ACTIVE SPRINKLERS	355.0 GPM

NODE ANALYSIS DATA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)
S1	32.0	K= 5.60	15.9	22.4
S2	32.0	K= 5.60	18.2	23.9
S3	32.0	K= 5.60	19.6	24.8
S4	32.0	K= 5.60	19.7	24.8
S5	32.0	K= 5.60	16.6	22.8
S6	32.0	K= 5.60	18.5	24.1
S7	32.0	K= 5.60	12.1	19.5
S8	32.0	K= 5.60	13.9	20.8
S9	32.0	K= 5.60	19.3	24.6
S10	32.0	K= 5.60	16.8	22.9
S11	32.0	K= 5.60	18.7	24.2
S12	32.0	K= 5.60	18.1	23.9
S13	32.0	K= 5.60	20.7	25.5
S14	32.0	K= 5.60	20.9	25.6
S15	32.0	K= 5.60	20.3	25.2
20	32.0	- - - -	20.8	- - -
21	32.0	- - - -	20.3	- - -
22	32.0	- - - -	20.1	- - -
23	32.0	- - - -	20.1	- - -
24	32.0	- - - -	20.2	- - -
25	32.0	- - - -	20.3	- - -
26	32.0	- - - -	20.4	- - -
27	32.0	- - - -	20.7	- - -
28	32.0	- - - -	22.2	- - -
29	32.0	- - - -	22.8	- - -
30	32.0	- - - -	23.6	- - -
31	32.0	- - - -	24.2	- - -
32	32.0	- - - -	25.6	- - -
33	32.0	- - - -	26.7	- - -
34	32.0	- - - -	27.5	- - -
35	32.0	- - - -	28.3	- - -
36	32.0	- - - -	28.9	- - -
37	32.0	- - - -	22.8	- - -
38	32.0	- - - -	21.7	- - -
39	32.0	- - - -	21.3	- - -
40	32.0	- - - -	29.4	- - -
41	2.0	- - - -	45.6	- - -
42	2.0	- - - -	45.6	- - -
43	2.0	- - - -	45.6	- - -
44	0.0	- - - -	46.5	- - -
BFP-OUT	0.0	- - - -	46.5	- - -

DATE: 4/28/2025HYDRAULICCALCULATIONS\WORKING\DRY SYSTEM INCLUDING BFP.SDF
JOB TITLE:

NODE ANALYSIS DATA

NODE TAG	ELEVATION (FT)	NODE TYPE	PRESSURE (PSI)	DISCHARGE (GPM)
BFP-IN	0.0	- - - -	51.5	- - -
45	0.0	- - - -	51.6	- - -
46	-5.0	- - - -	53.8	- - -
SRC	-5.0	SOURCE	53.9	355.0

PIPE DATA

PIPE TAG / END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) FL/FT	LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 1					-22.4	1.049 PL	10.00	PF	2.2
S1	32.0	5.6	15.9	22.4	8.3	100 FTG	----	PE	0.0
S2	32.0	5.6	18.2	23.9		0.224 TL	10.00	PV	
Pipe: 2					-46.2	1.049 PL	3.00	PF	2.6
S2	32.0	5.6	18.2	23.9	17.2	100 FTG	----	PE	0.0
27	32.0	0.0	20.7	0.0		0.859 TL	3.00	PV	
Pipe: 3					-24.8	1.049 PL	3.00	PF	0.8
S3	32.0	5.6	19.6	24.8	9.2	100 FTG	----	PE	0.0
26	32.0	0.0	20.4	0.0		0.271 TL	3.00	PV	
Pipe: 4					-24.8	1.049 PL	1.80	PF	0.5
S4	32.0	5.6	19.7	24.8	9.2	100 FTG	----	PE	0.0
24	32.0	0.0	20.2	0.0		0.272 TL	1.80	PV	
Pipe: 5					-22.8	1.049 PL	8.20	PF	1.9
S5	32.0	5.6	16.6	22.8	8.5	100 FTG	----	PE	0.0
S6	32.0	5.6	18.5	24.1		0.233 TL	8.20	PV	
Pipe: 6					-46.9	1.049 PL	1.80	PF	1.6
S6	32.0	5.6	18.5	24.1	17.4	100 FTG	----	PE	0.0
23	32.0	0.0	20.1	0.0		0.883 TL	1.80	PV	
Pipe: 7					-19.5	1.049 PL	10.00	PF	1.7
S7	32.0	5.6	12.1	19.5	7.2	100 FTG	----	PE	0.0
S8	32.0	5.6	13.9	20.8		0.174 TL	10.00	PV	
Pipe: 8					-40.3	1.049 PL	8.20	PF	5.5
S8	32.0	5.6	13.9	20.8	15.0	100 FTG	----	PE	0.0
S9	32.0	5.6	19.3	24.6		0.668 TL	8.20	PV	
Pipe: 9					-65.0	1.380 PL	1.80	PF	0.8
S9	32.0	5.6	19.3	24.6	13.9	100 FTG	----	PE	0.0
22	32.0	0.0	20.1	0.0		0.424 TL	1.80	PV	
Pipe: 10					-22.9	1.049 PL	8.20	PF	1.9
S10	32.0	5.6	16.8	22.9	8.5	100 FTG	----	PE	0.0
S11	32.0	5.6	18.7	24.2		0.235 TL	8.20	PV	
Pipe: 11					-47.1	1.049 PL	1.80	PF	1.6
S11	32.0	5.6	18.7	24.2	17.5	100 FTG	----	PE	0.0
21	32.0	0.0	20.3	0.0		0.891 TL	1.80	PV	
Pipe: 12					-23.9	1.049 PL	10.00	PF	2.5
S12	32.0	5.6	18.1	23.9	8.9	100 FTG	----	PE	0.0
S13	32.0	5.6	20.7	25.5		0.253 TL	10.00	PV	
Pipe: 13					-49.3	1.049 PL	2.20	PF	2.1
S13	32.0	5.6	20.7	25.5	18.3	100 FTG	----	PE	0.0
37	32.0	0.0	22.8	0.0		0.968 TL	2.20	PV	
Pipe: 14					-25.6	1.049 PL	3.00	PF	0.9
S14	32.0	5.6	20.9	25.6	9.5	100 FTG	----	PE	0.0
38	32.0	0.0	21.7	0.0		0.288 TL	3.00	PV	

DATE: 4/28/2025HYDRAULICCALCULATIONS\WORKING\DRY SYSTEM INCLUDING BFP.SDF
JOB TITLE:

PIPE TAG / END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) FL/FT		LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 15					-25.2	1.049	PL	1.80	PF	0.5
S15	32.0	5.6	20.3	25.2	9.4	100	FTG	----	PE	0.0
20	32.0	0.0	20.8	0.0		0.281	TL	1.80	PV	
Pipe: 16					116.8	3.068	PL	10.00	PF	0.5
20	32.0	0.0	20.8	0.0	5.1	100	FTG	T	PE	0.0
21	32.0	0.0	20.3	0.0		0.026	TL	20.71	PV	
Pipe: 17					69.6	3.068	PL	10.00	PF	0.2
21	32.0	0.0	20.3	0.0	3.0	100	FTG	T	PE	0.0
22	32.0	0.0	20.1	0.0		0.010	TL	20.71	PV	
Pipe: 18					4.6	3.068	PL	10.00	PF	0.0
22	32.0	0.0	20.1	0.0	0.2	100	FTG	T	PE	0.0
23	32.0	0.0	20.1	0.0		0.000	TL	20.71	PV	
Pipe: 19					-42.3	3.068	PL	10.00	PF	0.1
23	32.0	0.0	20.1	0.0	1.8	100	FTG	T	PE	0.0
24	32.0	0.0	20.2	0.0		0.004	TL	20.71	PV	
Pipe: 20					-67.1	3.068	PL	3.00	PF	0.1
24	32.0	0.0	20.2	0.0	2.9	100	FTG	E	PE	0.0
25	32.0	0.0	20.3	0.0		0.009	TL	8.00	PV	
Pipe: 21					-67.1	3.068	PL	6.25	PF	0.2
25	32.0	0.0	20.3	0.0	2.9	100	FTG	T	PE	0.0
26	32.0	0.0	20.4	0.0		0.009	TL	16.96	PV	
Pipe: 22					-91.9	3.068	PL	10.00	PF	0.3
26	32.0	0.0	20.4	0.0	4.0	100	FTG	T	PE	0.0
27	32.0	0.0	20.7	0.0		0.016	TL	20.71	PV	
Pipe: 23					-138.1	3.068	PL	36.00	PF	1.4
27	32.0	0.0	20.7	0.0	6.0	100	FTG	E	PE	0.0
28	32.0	0.0	22.2	0.0		0.035	TL	41.00	PV	
Pipe: 24					-138.1	3.068	PL	12.50	PF	0.6
28	32.0	0.0	22.2	0.0	6.0	100	FTG	E	PE	0.0
29	32.0	0.0	22.8	0.0		0.035	TL	17.50	PV	
Pipe: 25					-138.1	3.068	PL	17.22	PF	0.8
29	32.0	0.0	22.8	0.0	6.0	100	FTG	E	PE	0.0
30	32.0	0.0	23.6	0.0		0.035	TL	22.22	PV	
Pipe: 26					-138.1	3.068	PL	12.50	PF	0.6
30	32.0	0.0	23.6	0.0	6.0	100	FTG	E	PE	0.0
31	32.0	0.0	24.2	0.0		0.035	TL	17.50	PV	
Pipe: 27					-138.1	3.068	PL	35.00	PF	1.4
31	32.0	0.0	24.2	0.0	6.0	100	FTG	E	PE	0.0
32	32.0	0.0	25.6	0.0		0.035	TL	40.00	PV	
Pipe: 28					-138.1	3.068	PL	26.50	PF	1.1
32	32.0	0.0	25.6	0.0	6.0	100	FTG	E	PE	0.0
33	32.0	0.0	26.7	0.0		0.035	TL	31.50	PV	
Pipe: 29					-138.1	3.068	PL	18.30	PF	0.8
33	32.0	0.0	26.7	0.0	6.0	100	FTG	E	PE	0.0
34	32.0	0.0	27.5	0.0		0.035	TL	23.30	PV	

DATE: 4/28/2025HYDRAULICCALCULATIONS\WORKING\DRY SYSTEM INCLUDING BFP.SDF
JOB TITLE:

PIPE TAG / END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) FL/FT		LENGTH (FT)		PRESS. SUM. (PSI)
Pipe: 30					-138.1	3.068	PL	18.85	PF	0.8
34	32.0	0.0	27.5	0.0	6.0	100	FTG	E	PE	0.0
35	32.0	0.0	28.3	0.0		0.035	TL	23.85	PV	
Pipe: 31					-138.1	3.068	PL	5.10	PF	0.6
35	32.0	0.0	28.3	0.0	6.0	100	FTG	T	PE	0.0
36	32.0	0.0	28.9	0.0		0.035	TL	15.81	PV	
Pipe: 32					216.9	3.068	PL	64.77	PF	6.1
36	32.0	0.0	28.9	0.0	9.4	100	FTG	T	PE	0.0
37	32.0	0.0	22.8	0.0		0.081	TL	75.48	PV	
Pipe: 33					167.6	3.068	PL	11.00	PF	1.0
37	32.0	0.0	22.8	0.0	7.3	100	FTG	2E	PE	0.0
38	32.0	0.0	21.7	0.0		0.050	TL	20.99	PV	
Pipe: 34					142.0	3.068	PL	6.25	PF	0.4
38	32.0	0.0	21.7	0.0	6.2	100	FTG	E	PE	0.0
39	32.0	0.0	21.3	0.0		0.037	TL	11.25	PV	
Pipe: 35					142.0	3.068	PL	3.00	PF	0.5
39	32.0	0.0	21.3	0.0	6.2	100	FTG	T	PE	0.0
20	32.0	0.0	20.8	0.0		0.037	TL	13.71	PV	
Pipe: 36					-355.0	4.026	PL	2.50	PF	0.5
36	32.0	0.0	28.9	0.0	8.9	100	FTG	E	PE	0.0
40	32.0	0.0	29.4	0.0		0.053	TL	9.64	PV	
Pipe: 37					355.0	4.026	PL	30.00	PF	3.2
41	2.0	0.0	45.6	0.0	8.9	100	FTG	TGD	PE	-13.0
40	32.0	0.0	29.4	0.0		0.053	TL	59.98	PV	
Pipe: 38					-355.0	7.981	PL	6.00	PF	0.0
41	2.0	0.0	45.6	0.0	2.3	120	FTG	----	PE	0.0
42	2.0	0.0	45.6	0.0		0.001	TL	6.00	PV	
Pipe: 39					-355.0	7.981	PL	2.00	PF	0.0
42	2.0	0.0	45.6	0.0	2.3	120	FTG	E	PE	0.0
43	2.0	0.0	45.6	0.0		0.001	TL	20.00	PV	
Pipe: 40					-355.0	7.981	PL	2.00	PF	0.0
43	2.0	0.0	45.6	0.0	2.3	120	FTG	E	PE	0.9
44	0.0	0.0	46.5	0.0		0.001	TL	20.00	PV	
Pipe: 41					-355.0	7.981	PL	2.00	PF	0.0
44	0.0	0.0	46.5	0.0	2.3	120	FTG	----	PE	0.0
BFP-OUT	0.0	0.0	46.5	0.0		0.001	TL	2.00	PV	
Pipe: 42					FIXED PRESSURE LOSS DEVICE					
BFP-IN	0.0	0.0	51.5	0.0	5.0 psi, 355.0 gpm					
BFP-OUT	0.0	0.0	46.5	0.0						
Pipe: 43					-355.0	7.981	PL	4.00	PF	0.0
BFP-IN	0.0	0.0	51.5	0.0	2.3	120	FTG	E	PE	0.0
45	0.0	0.0	51.6	0.0		0.001	TL	22.00	PV	
Pipe: 44					-355.0	7.981	PL	5.00	PF	0.0
45	0.0	0.0	51.6	0.0	2.3	120	FTG	E	PE	2.2
46	-5.0	0.0	53.8	0.0		0.001	TL	23.00	PV	

PIPE TAG / END NODES	ELEV. (FT)	NOZ. (K)	PT (PSI)	DISC. (GPM)	Q(GPM) VEL(FPS)	DIA(IN) HW(C) FL/FT	LENGTH (FT)		PRESS. SUM. (PSI)	
Pipe: 45					-355.0	7.981	PL	82.00	PF	0.1
46	-5.0	0.0	53.8	0.0	2.3	120	FTG	----	PE	0.0
SRC	-5.0	SRCE	53.9	(N/A)		0.001	TL	82.00	PV	

NOTES (HASS):

(1) Calculations were performed by the HASS computer program in accordance with NFPA (2020) under license no. 65699794 granted by

HRS Systems, Inc.
208 Southside Square
Petersburg, TN 37144
(931) 659-9760

(2) The system has been calculated to provide an average imbalance at each node of 0.001 gpm and a maximum imbalance at any node of 0.059 gpm.

(3) Total pressure at each node is used in balancing the system. Maximum water velocity is 18.3 ft/sec at pipe 13.

(4) Items listed in bold print on the cover sheet

are automatically transferred from the calculation report.

(5) Available pressure at source node SRC under full flow conditions is 59.35 psi with a flow of 384.59 gpm.

(6) PIPE FITTINGS TABLE

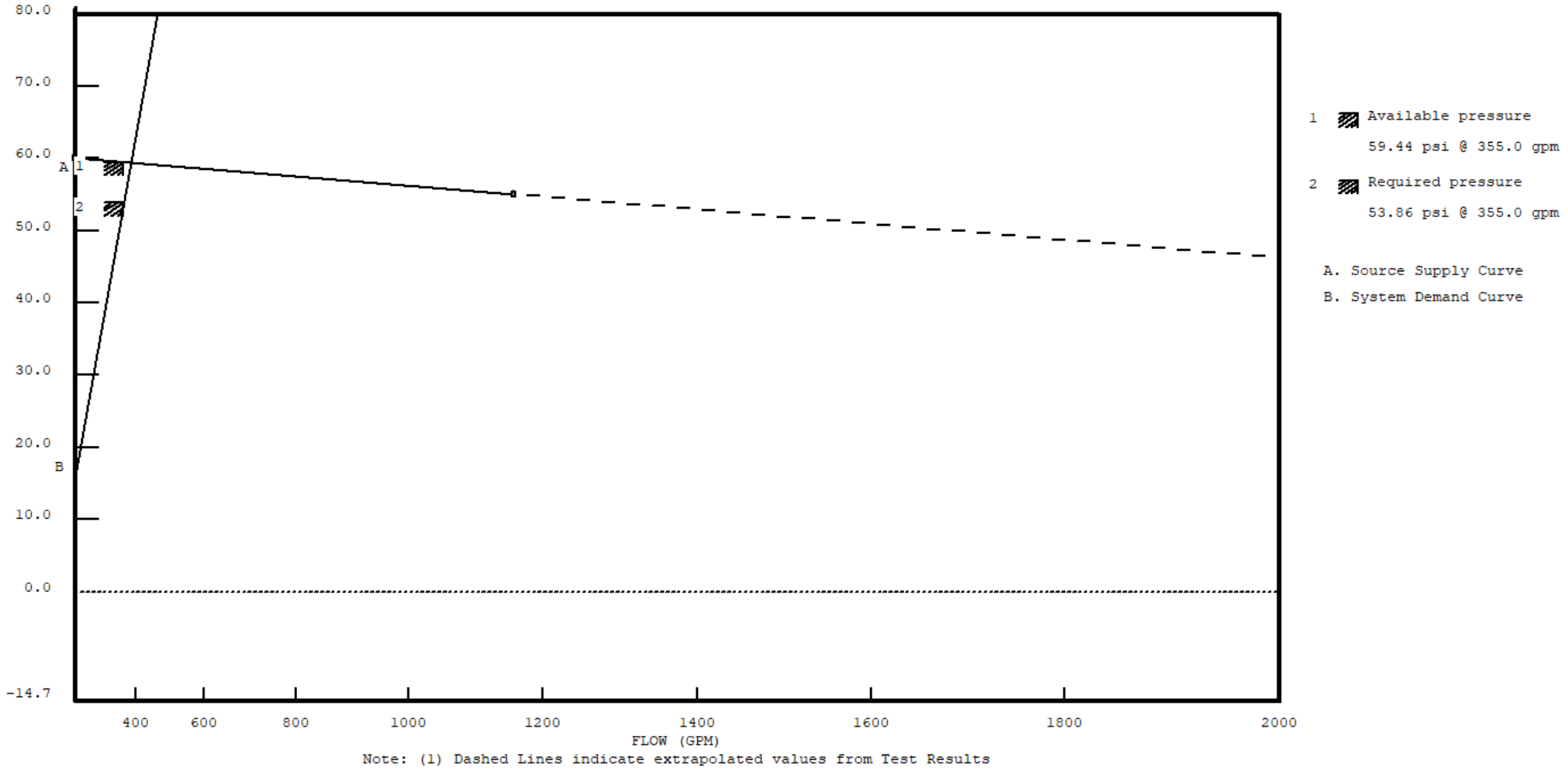
HASS Pipe Table Name: standard

PAGE: A MATERIAL: S40 HWC: 120

Diameter (in)	Equivalent Fitting Lengths in Feet								
	E Ell	T Tee	L LngEll	C ChkVlv	B BfyVlv	G GatVlv	A AlmChk	D DPVlv	N NTee
1.049	F F45Ell 2.00 1.00	5.00	2.00	5.00	6.00	1.00	10.00	2.00	5.00
1.380	3.00 1.50	6.00	2.00	7.00	6.00	1.00	10.00	10.00	6.00
3.068	7.00 3.50	15.00	5.00	16.00	10.00	1.00	13.00	13.00	15.00
4.026	10.00 5.00	20.00	6.00	22.00	12.00	2.00	20.00	20.00	20.00
7.981	18.00 9.00	35.00	13.00	45.00	12.00	4.00	31.00	31.00	35.00

WATER SUPPLY ANALYSIS

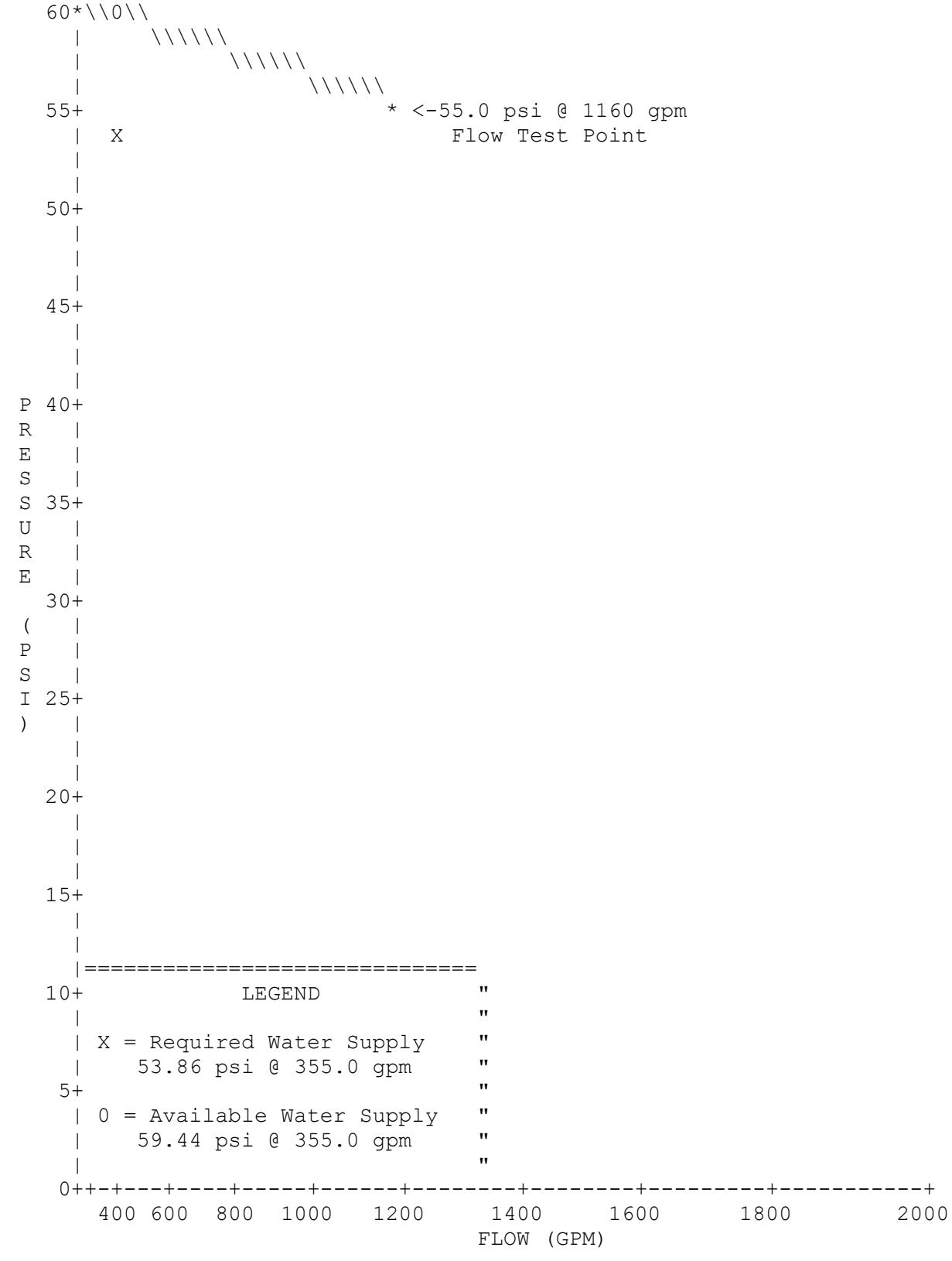
Static: 60.00 psi Resid: 55.00 psi Flow: 1160.0 gpm



Note: (1) Dashed Lines indicate extrapolated values from Test Results

DATE: 4/28/2025HYDRAULICCALCULATIONS\WORKING\DRY SYSTEM INCLUDING BFP.SDF
JOB TITLE:

WATER SUPPLY CURVE



Model 350DA

Double Check Detector Assembly

Application

Designed for installation on water lines in fire protection systems to protect against both backsiphonage and backpressure of polluted water into the potable water supply. Model 350DA shall provide protection where a potential health hazard does not exist. Incorporates metered by-pass to detect leaks and unauthorized water use.

Standards Compliance

(Sizes 2 1/2" - 10" Horiz. & Vert.)
(12" Horizontal Only)

- ASSE® Listed 1048 (Sizes 2 1/2" thru 12")
- CSA® Certified B64.5 (Sizes 2 1/2" thru 8", & 12")
- AWWA Compliant C510 (Sizes 2 1/2" thru 12"), and C550
- UL® Classified (Sizes 2 1/2" thru 12")
- C-UL® Classified (Sizes 2 1/2" thru 12")
- FM® Approved (Sizes 2 1/2" thru 10")
- NYC MEA 147-99-M Vol 4 (2-1/2" - 10)
- Approved by the Foundation for Cross Connection Control and Hydraulic Research at the University of Southern California (Sizes 2 1/2" thru 12")
- Meets the requirements of NSF/ANSI/CAN 61*

*(0.25% MAX. WEIGHTED AVERAGE LEAD CONTENT)

By-Pass Backflow Assembly 3/4" Model 950XLD

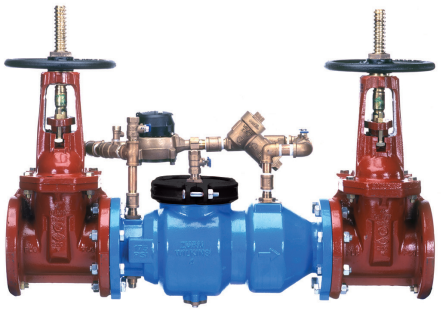
Materials

Main valve body	Ductile Iron ASTM A 536
Access covers	Ductile Iron ASTM A 536
Coatings	NSF Approved fusion epoxy finish
Internals	Stainless steel, 300 Series NORYL™
Fasteners	Stainless Steel, 300 Series
Elastomers	EPDM (FDA approved) Buna Nitrile (FDA approved)
Polymers	NORYL™
Springs	Stainless Steel, 300 Series

Dimensions & Weights (do not include pkg.)

MODEL 350ADA SIZE		WEIGHT							
		LESS SHUT-OFF VALVES		OS&Y GATE VALVES FLANGED		OS&Y GATE VALVES GROOVED		BUTTERFLY VALVES GROOVED	
in.	mm	lbs.	kg	lbs.	kg	lbs.	kg	lbs.	kg
2 1/2	65	68	31	178	81	160	73	140	64
3	80	68	31	198	90	150	68	120	54
4	100	106	48	296	134	282	128	190	86
6	150	180	82	480	218	454	206	298	135
8	200	374	170	850	386	802	364	548	249
10	250	404	183	1222	554	1156	524	792	359
12	300	463	210	1623	736	n/a	n/a	n/a	n/a

Attention:
Model 350DA (flange body) and Model 350ADA (grooved body) have different lay lengths.



LEAD FREE

ALS
NSF/ANSI/CAN 61

Options

(Suffixes can be combined)

- ☐ - with OS & Y gate valves (standard)
- ☐ L - less shut-off valves (flanged body connections)
- ☐ LM - less water meter
- ☐ - with gallon meter (standard)
- ☐ CFM - with cu ft meter
- ☐ CMM - with cu meter meter
- ☐ G - with groove end gate valves
- ☐ FG - with flanged inlet connection and grooved outlet connection
- ☐ PI - with Post Indicator Gate Valve
- ☐ GF - with flanged inlet connection and grooved outlet connection
- ☐ BG - with grooved end butterfly valves with integral monitor switches (2 1/2" - 10")

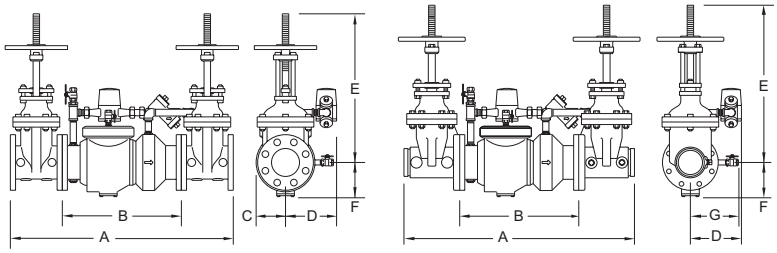
Accessories

- ☐ Repair kit (rubber only)
- ☐ Thermal expansion tank (Model XT)
- ☐ OS & Y Gate valve tamper switch (OSY-40)

Features

Sizes: 2 1/2", 3", 4", 6", 8", 10", 12"

Maximum working water pressure	175 PSI
Maximum working water temperature	140°F
Hydrostatic test pressure	350 PSI
End connections (Grooved for steel)	AWWA C606
(Flanged bolt pattern)	ASME B16.42 Class 150



MODEL 350DAG SHOWN ABOVE

MODEL 350DA SIZE		DIMENSION (approximate)																			
		A		A WITH BUTTERFLY VALVES		B LESS GATE VALVES		C		D		E OS&Y OPEN		E OS&Y CLOSED		E WITH BUTTERFLY VALVES		F		G	
in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
2 1/2	65	31	787	28	711	15 7/8	403	3 3/4	95	9	229	17 3/4	451	15 3/8	391	13 3/4	349	3 1/2	89	7 1/4	184
3	80	32	813	28 1/2	724	15 7/8	403	3 3/4	95	9	229	20 1/4	514	17	432	13 3/4	349	3 1/2	89	7 1/4	184
4	100	37 5/8	956	32 8/9	835	19 1/2	495	4 1/2	114	9	229	22 1/2	572	18 1/4	464	17	432	6	152	8	203
6	150	44 5/8	1133	37 5/8	956	23 1/2	597	6	152	10 1/2	267	30 1/2	775	24 1/4	616	17 1/2	445	7	178	10	254
8	200	60 7/8	1546	53 7/8	1369	37 3/4	959	10	254	12	305	37	940	28 1/2	724	16 15/16	430	8 1/2	216	11	279
10	250	63 7/8	1622	57 7/8	1470	37 3/4	959	10	254	12	305	45 5/8	1159	34 3/4	883	16 15/16	430	8 1/2	216	12	305
12	300	66 3/16	1681	n/a	n/a	38	965	10	254	12	305	53	1346	40 1/2	1029	n/a	n/a	8 7/8	226	16 3/4	425

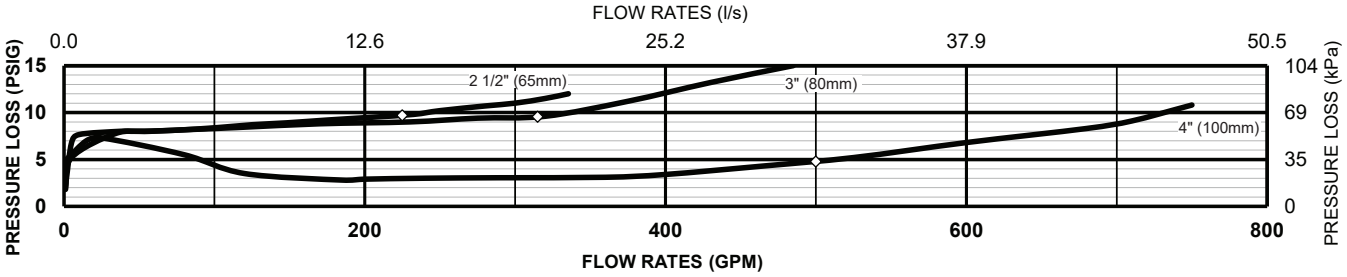
Zurn Industries, LLC | Wilkins
1747 Commerce Way, Paso Robles, CA U.S.A. 93446 Ph. 855-663-9876, Fax 805-238-5766
In Canada | **Zurn Industries Limited**
7900 Goreway Drive, Unit 10, Brampton, Ontario L6T 5W6, 877-892-5216
www.zurn.com

Rev. Q
Date: 9/22
Document No. BF-350DA
Product No. Model 350DA
Patent zurn.com/patents

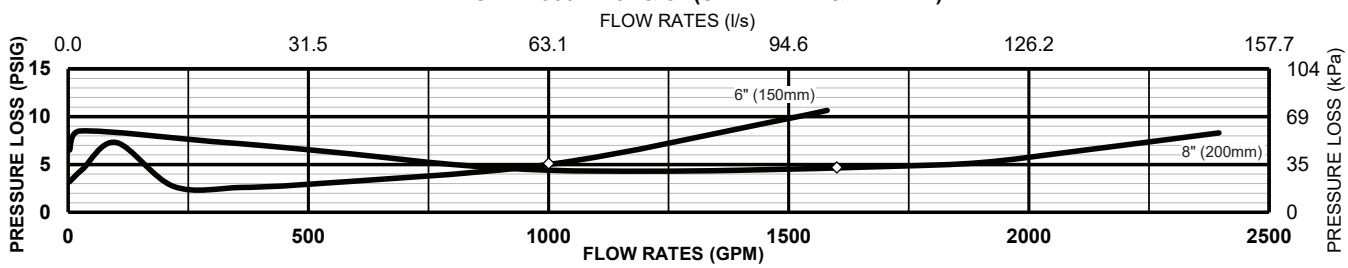
Flow Characteristics

◊Rated Flow (established by approval agencies)

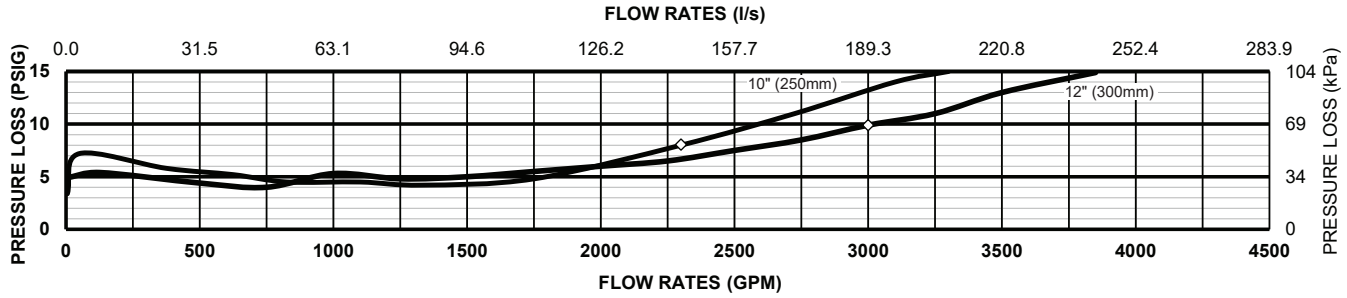
MODEL 350DA 2 1/2", 3" & 4" (STANDARD & METRIC)



MODEL 350DA 6" & 8" (STANDARD & METRIC)



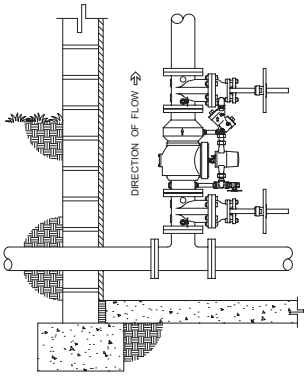
MODEL 350DA 10" & 12" (STANDARD & METRIC)



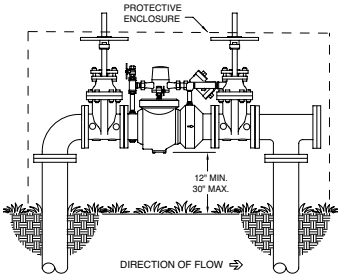
Typical Installation

Local codes shall govern installation requirements. Unless otherwise specified, the assembly shall be mounted at a minimum of 12" (305mm) and a maximum of 30" (762mm) above adequate drains with sufficient side clearance for testing and maintenance. The installation shall be made so that no part of the unit can be submerged.

Capacity thru Schedule 40 Pipe (GPM)				
Pipe size	5 ft/sec	7.5 ft/sec	10 ft/sec	15 ft/sec
2 1/2"	75	112	149	224
3"	115	173	230	346
4"	198	298	397	595
6"	450	675	900	1351
8"	780	1169	1559	2339
10"	1229	1843	2458	3687
12"	1763	2644	3525	5288



VERTICAL INSTALLATION



OUTDOOR INSTALLATION

Specifications

The Double Check Detector Backflow Prevention Assembly shall be certified to NSF/ANSI/CAN 61, ASSE® Listed 1048, and supplied with full port gate valves. The main body and access cover shall be epoxy coated ductile iron (ASTM A 536), the seat ring and check valve shall be Noryl™, the stem shall be stainless steel (ASTM A 276) and the seat disc elastomers shall be EPDM. The first and second check valves shall be accessible for maintenance without removing the device from the line. The Double Check Detector Backflow Prevention Assembly shall be a ZURN WILKINS Model 350DA.

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BRAMPTON
Flower City
brampton.ca

Planning and Development Services
Building Division
8850 McLaughlin Road, Unit 1
Brampton, ON L6Y 5T1

April 3, 2025
Via Email

BMI ENGINEERING INC.

c/o: BIJAN HOMAYOUNI
5000 Yonge St E Bldg 1901
Toronto, ON
M2N 7E9

Dear BIJAN:

RE: Notice of Building Review Deficiencies

Permit Application:	**2025 031148 000 00**
Applied For On:	**February 28, 2025**
Address of Work:	**2691 Sandalwood Pky E**
Scope of Work:	**TENANT - FIRE STATION 209 Mechanical equipment replacement and upgrade including installation of two new backflow preventers**

Please be advised that the Architectural and Structural review of your application was completed on Thursday, April 3, 2025.

To bring this submission into compliance with the Building Code Act, S.O. 1992, c.23 and the Ontario Building Code 2012, as amended, the following deficiencies need to be addressed or information is required:

Deficiencies:

1. Submit a sprinkler drawing and hydraulic calculations demonstrating that the installation of a backflow preventer will not adversely affect the existing sprinkler system, or a letter from a Professional Engineer clearly analyzing and outlining the hydraulic impact of the backflow preventer on the system.

Submission:
Please submit a revised submission(s) via Brampton Portal:
https://bramptonbbp.brampton.ca/citizenportal/app/landing

To streamline our review process and avoid duplication of effort, we kindly request that you upload the revised documents directly to our portal instead of emailing to an individual plans examiner. This approach will help ensure all submissions are properly logged and accessible to our team. We appreciate your help.

Inquiries about the Brampton Building and Business Portal can be directed to: building.inquiries@brampton.ca

Please note that the completion of the review and the issuance of a building permit is dependent upon the receipt of the above noted information. If you have questions specific to the deficiencies listed above, please contact the undersigned.

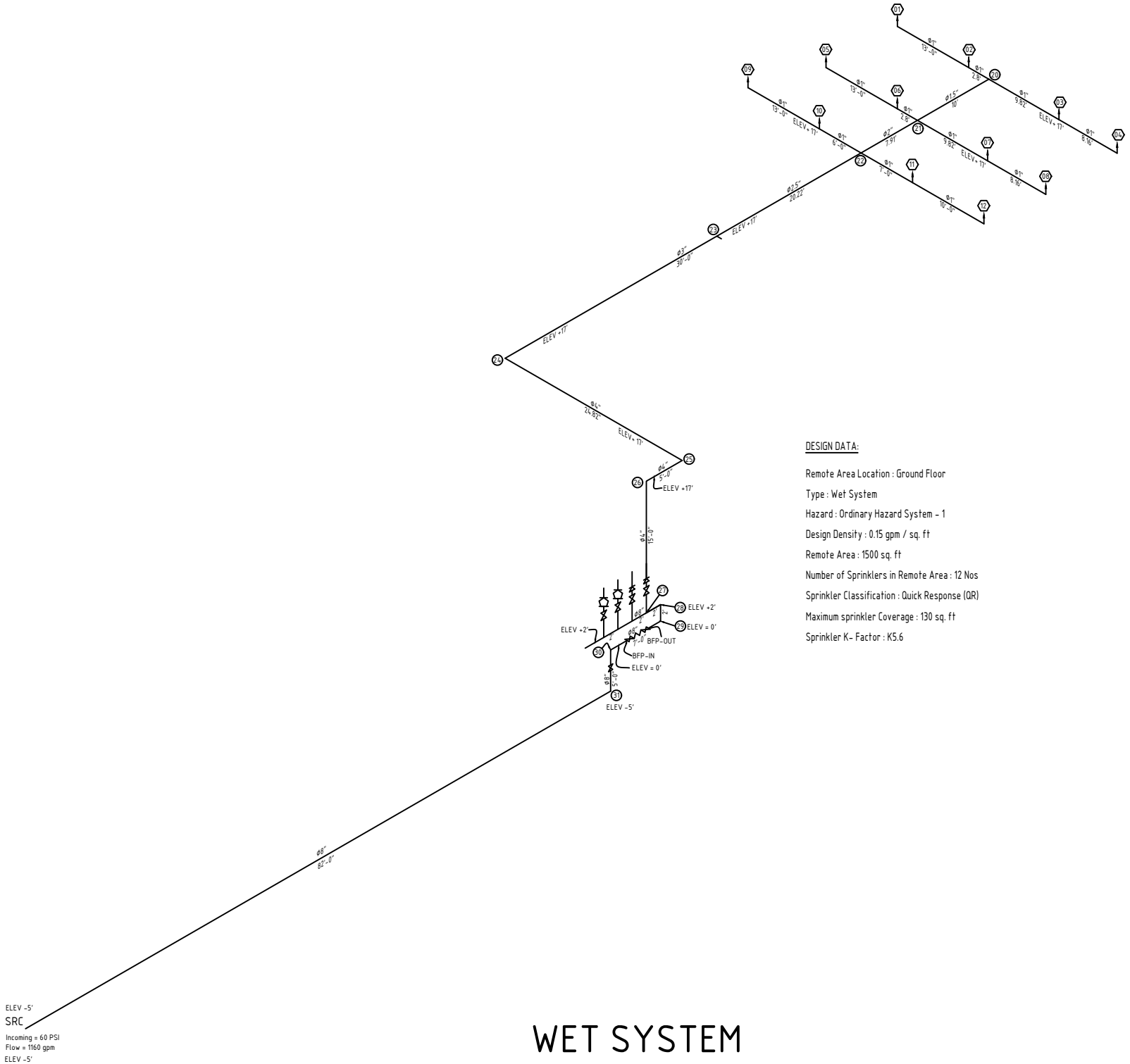
As the application proceeds through the next stages of review, you may receive additional notices of deficiency.

Yours truly,

_____
Akemi Mizusawa
(905) 874-2476
Akemi.Mizusawa@brampton.ca

Please Note:
- It is illegal to commence construction without first having obtained a building permit.
- Where an application remains incomplete or inactive for a period of six months or more, the application will be deemed abandoned.

CC. CITY OF BRAMPTON - TALHA SHEIKH (owner)
2 Wellington St W Brampton ON L5W1E1



DESIGN DATA:

Remote Area Location : Ground Floor

Type : Wet System

Hazard : Ordinary Hazard System - 1

Design Density : 0.15 gpm / sq. ft

Remote Area : 1500 sq. ft

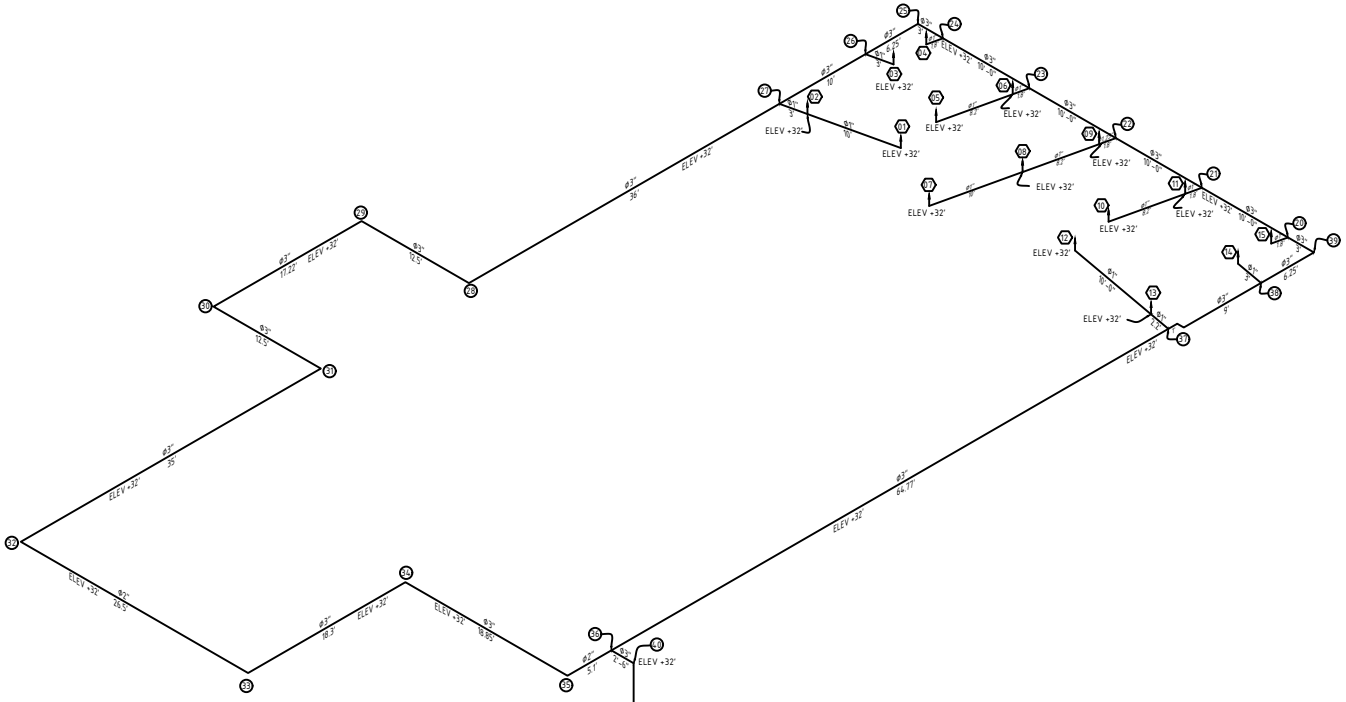
Number of Sprinklers in Remote Area : 12 Nos

Sprinkler Classification : Quick Response (QR)

Maximum sprinkler Coverage : 130 sq. ft

Sprinkler K- Factor : K5.6

WET SYSTEM



DESIGN DATA:

Remote Area Location : Attic Floor

System Type : Dry System

Hazard : Ordinary Hazard System - 1

Design Density : 0.15 gpm / sq. ft

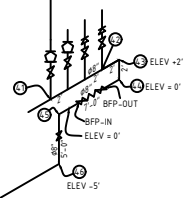
Remote Area : 1950 sq. ft

Number of Sprinklers in Remote Area : 15 Nos

Sprinkler Classification : Quick Response Upright

Maximum sprinkler Coverage : 130 sq. ft

Sprinkler K- factor : K5.6



DRY SYSTEM

ELEV -5'

SRC

Incoming = 60 PSI

Flow = 1160 gpm