طرح نگهداشت و افزایش تولید ۲۷ مخزن

Fire Water Hydraulic Calculation Note

نگهداشت و افزایش تولید میدان نفتی بینک

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Class: 2 **CLIENT Doc. Number: F0Z-708988**

Status:

IDC: Inter-Discipline Check
IFC: Issued For Comment
IFA: Issued For Approval
AFD: Approved For Design
AFC: Approved For Construction
AFP: Approved For Purchase
AFQ: Approved For Quotation
IFI: Issued For Information
AB-R: As-Built for CLIENT Review
AB-A: As-Built –Approved

REVISION RECORD SHEET

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CONTENTS

1.0 INTRODUCTION

Binak oilfield in Bushehr province is a part of the southern oilfields of Iran, is located 20 km northwest of Genaveh city.

With the aim of increasing production of oil from Binak oilfield, an EPC/EPD Project has been defined by NIOC/NISOC and awarded to Petro Iran Development Company (PEDCO). Also PEDCO (as General Contractor) has assigned the EPC-packages of the Project to "Hirgan Energy - Design and Inspection" JV.

As a part of the Project, a New Gas Compressor Station (adjacent to existing Binak GCS) shall be constructed to gather of 15 MMSCFD (approx.) associated gases and compress & transfer them to Siahmakan GIS.

GENERAL DEFINITION

The following terms shall be used in this document.

CLIENT:	National Iranian South Oilfields Company (NISOC)
PROJECT:	Binak Oilfield Development – Surface Fcilities; New Gas Compressor Station
EPD/EPC CONTRACTOR (GC):	Petro Iran Development Company (PEDCO)
EPC CONTRACTOR:	Joint Venture of : Hirgan Energy – Design & Inspection (D&I) Companies
VENDOR:	The firm or person who will fabricate the equipment or material.
EXECUTOR:	Executor is the party which carries out all or part of construction and/or commissioning for the project.
THIRD PARTY INSPECTOR (TPI):	The firm appointed by EPD/EPC CONTRACTOR (GC) and approved by CLIENT (in writing) for the inspection of goods.
SHALL:	Is used where a provision is mandatory.
SHOULD:	Is used where a provision is advisory only.
WILL:	Is normally used in connection with the action by CLIENT rather than by an EPC/EPD CONTRACTOR, supplier or VENDOR.
MAY:	Is used where a provision is completely discretionary.

2.0 SCOPE

The purpose of this calculation document is to establish the hydraulic performance and fire equipment capacities for the new Fire water systems associated with the Construction of Gas Compressor station Equipment.

3.0 NORMATIVE REFERENCES

3.1 CODES AND STANDARDS

• IPS-E-SF-220	Fire Water Distribution and Storage Facilities
• API-RP 2030	Application of Fixed Water Spray Systems for Fire Protection in the Petroleum and Petrochemical Industries
• TOTAL GS-EP-SAF-322	Fixed firewater system
• NFPA 15	Standard for water spray fixed systems for fire protection

3.2 THE PROJECT DOCUMENTS

- BK-GCS-PEDCO-120-SA-DB-0001 Active Fire Protection and Safety Concept
- BK-GCS-PEDCO-120-SA-CN-0002 Calculation Note For Fire Water Demand
- BK-GCS-PEDCO-120-SA-PY-0001 Fire Water Network Layout

3.3 ENVIRONMENTAL DATA

Refer to "Process Basis of Design; Doc. No. BK-GNRL-PECO-000-PR-DB-0001".

3.4 ABBREVIATION

AFP	Active Fire Protection
ALARP	As Low As Reasonably Practicable
F&G	Fire & Gas
HAZID	Hazard Identification
HAZOP	Hazard and Operability Study
HSE	Health, Environment and Safety
ISBL	Inside Boundary Limit
OSBL	Outside Boundary Limit
PFP	Passive Fire Protection
SIL	Safety Integrity Level
CGD	Catalytic Gas Detectors
IRGD	Infrared Gas Detectors

4.0 METODOLOGY

Demand (flow and pressure) were established as per Calculation Note For Fire Water Demand to Doc. NO. BK-GCS-PEDCO-120-SA-CN-0002.

The following methodology is followed for the hydraulics calculations for verification of the adequacy of the specified performance requirements of the firewater system.

- Generate/select various fire water demand scenarios.
- Select the proper firewater pump

5.0 HYDRAULIC CALCULATION

5.1 CALCULATION SOFTWARE

The hydraulic calculations are performed by software PIPENET VISION Spray/Sprinkler Module, Version 1.8.

5.2 PIPENETMODEL AND INPUT DATA

This section provides details of input/assumption utilized for the hydraulic calculations by software PIPENET VISION Spray/Sprinkler Module.

Piping Data: ANSI B36.10 Sch.40, C factor = 120,

Design maximum velocity (Main lines & headers) = 3.5 m/sec

Standard valves and fittings equivalent length: PIPENET built-in data as per NFPA standard

Firewater Medium: Raw water

Density = 1030 kg/m3 @15°C

Viscosity = 0.001 Pas.

Details of pipe fittings and valves present on the pipe sections, node elevations, pipe lengths and pipe configuration will be later based on piping isometrics generated from the 3D-Model. This assumption will be thus updated once isometrics are available for the network piping.

Friction losses within the system are calculated by PIPENET using the Hazen-Williams equation.

5.3 SCENARIOS

Firewater will be fed from 1 x 100% firewater pumps based on the result of firewater demand report with capacity of 454.2 m3/hr.

Below scenarios should be studied in this report to calculate the required pressure of firewater pump, ring, deluge valve and also size of the ring and other facilities. For this purpose:

1. Ring main should be studied for maximum demand of flow rate to calculate the size of ring main and deluge valve feed lines. For this case two additional conditions should be studied if the ring main is broken in some areas.
2. Calculation implemented to design the required pressure at discharge of the firewater pump.
3. Deluge valve will be studied for the size of deluge lines according to most remote nozzle required flow rate.

6.0 CALCULATION RESULTS

6.1 SCENARIO 1 – CALCULATE THE RING SIZE AND FIRE WATER PUMPS DISCHARGE PRESUURE BASED ON MAXIMUM FIREWATER DEMAND SCENARIOS

The following table reflects the required pressured at fire water pumps discharge header, size of ring main and other facilities based on PIPENET hydraulic calculation results (see attached Appendices).

Table 1: Firewater ring main size and fire water pumps discharge header pressure based on PIPENET calculation without any blocked pipe section in fire water network

Fire Scenario Description	Required Flow Rate (lpm) Note 1	Minimum Required Pressure at users (barg)- Note 2	Calculated Maximum ring size (inch)	Calculated Pressure at Fire Water Pump Discharge Header (barg)
Fire in Most Remote Point of Fire Water Network, without any blocked pipe section in fire water network	6496	10	10	10.33

1. Based on Calculation Note For Fire Water Demand, BK-GCS-PEDCO-120-SA-CN-0002
2. At the inlet flange of firefighting equipment (hydrant valve) – based on IPS-E-SF-220

As per NFPA-20, the suction and discharge size of each firewater pump with capacity of 454.2

m3/hr is 10".

Hydrant is 4" and hydrant/monitor is 6" based on standards and also NISOC recommendations.

Based on the above calculated sizes, pressure at discharge of firewater pumps will be as the result of scenario 2.

6.2 SCENARIO 2 – CALCULATE THE FIRE WATER PUMPS DISCHARGE PRESUURE BASED ON MAXIMUM FIREWATER DEMAND SCENARIOS WITH A STRATEGIC BLOCKED PIPE

The following table reflects the summary of firewater pump pressure based on PIPENET hydraulic calculation results (see attached Appendices).

Table 2: Firewater ring main size and fire water pumps discharge header pressure based on PIPENET calculation with a strategic blocked pipe

Fire Scenario Description	Required Flow Rate (lpm) Note 1	Minimum Required Pressure at users (barg)- Note 2	Strategic Blocked Pipe Label	Calculated Pressure at Fire Water Pump Discharge Header (barg)
Fire in Most Remote Point of Fire Water Network, with a strategic blocked pipe section in fire water network	2000	10	23	10.29

1. Based on firewater demand
2. At the inlet flange of firefighting equipment (hydrant valve) – based on IPS-E-SF-220

As per result, discharge pressure of firewater pump in case of maximum firewater demand at farthest point will be 10.29 barg.

6.3 SCENARIO 3 – CALCULATE THE SIZE OF EACH DELUGE LINE BASED ON CALCULATED MOST REMOTE NOZZLE CALCULATION

The following table reflects the sizes of deluge valve spray lines and required pressure in downstream of each deluge valve based on PIPENET hydraulic calculation results (see attached Appendices).

Table 3: Deluge line sizes and pressure based on PIPENET calculation

Deluge Name	Pressure in inlet of DV (barg) Note 1	DV Size Note 2	Size of DV Lines (inch)	Required Pressure in DV down stream	Spray Nozzles K-factor
DV-2301	10.4 - 11.4	4	4	5.7	18 35 51
DV-2302	10.4 - 11.4	6	4	5.6	64 35 30
DV-2303	10.4 - 11.4	6	4	5.6	64 35 30
DV-2304	10.4 - 11.4	6	4	5	64 35 26

1. Based on Hydraulic calculation report
2. Based on Calculation Note For Fire Water Demand, BK-GCS-PEDCO-120-SA-CN-0002

7.0 CONCLUSION

Based on the result, firewater pumps should deliver flow of 6496 LPM @ 10.33 barg at the discha rge tie-in of pumps to cater maximum firewater demand on the plant.

With considering of 10 barg pressure on farthest hydrant, minimum required pressure will be 10.33 barg at the firewater pump discharge to cater required firewater demand on the plant.

As per NFPA-20, the suction and discharge size of firewater pumps with capacity of 454.2 m3/hr is 10”. In addition, based on standard and considering of the above calculation results, pump disc harge header and ring main sizes will be considered 10”.

Table 3 shows the Deluge Valve size and also Deluge line sizes and pressure. Deluge sprays sh ould be provided with K factors according to table 3. (Data should be confirmed by deluge valve v endor)

Hydrant is 4” and hydrant/monitor is 6” based on standards and also NISOC recommendations.

8.0 ATTACHMENTS

Att.1: FIRE WATER NETWORK HYDRAULIC CALCULATION

Att. 1.1:

- FWHC-Most Remote Point-Normal, Calculation Report

Att. 1.2:

- FWHC-Most Remote Point-Block, Calculation Report

Att.2: DELUGE SYSTEMS HYDRAULIC CALCULATION

Att.2.1:

- DV-2301, Calculation Report

Att.2.2:

- DV-2302, Calculation Report

Att.2.3:

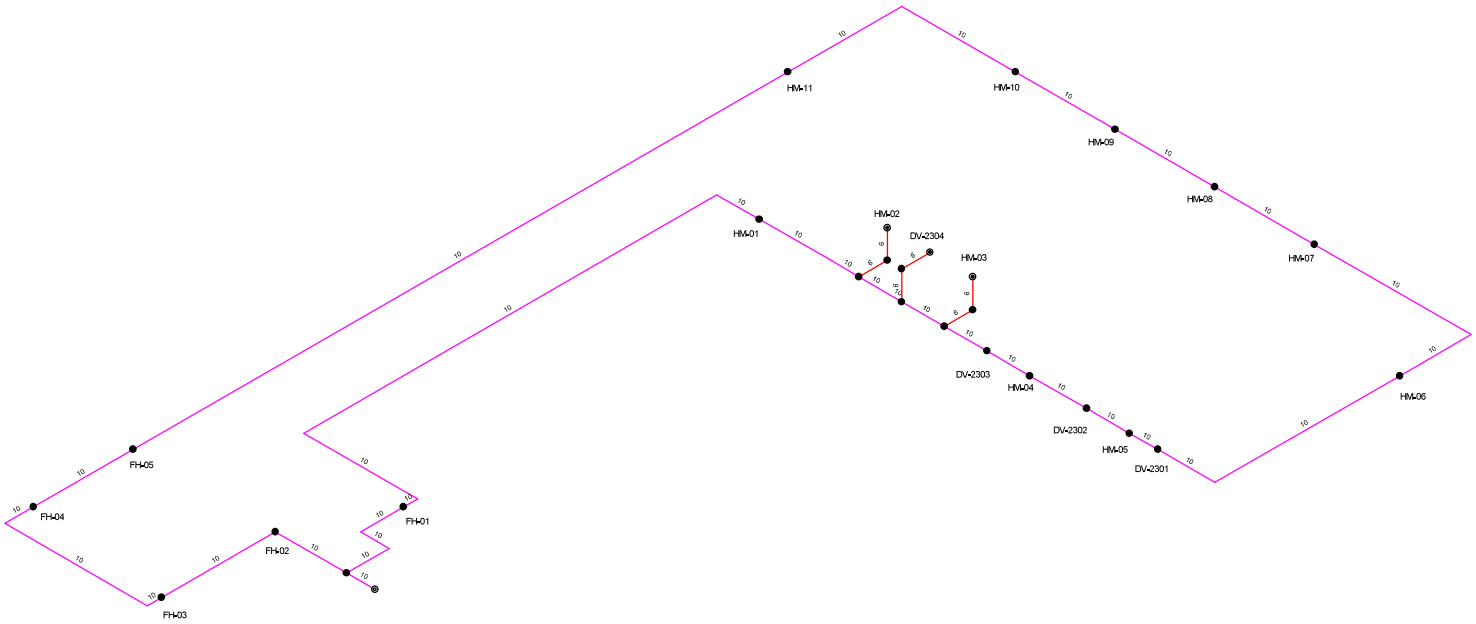
- DV-2303, Calculation Report

Att.2.4:

- DV-2304, Calculation Report

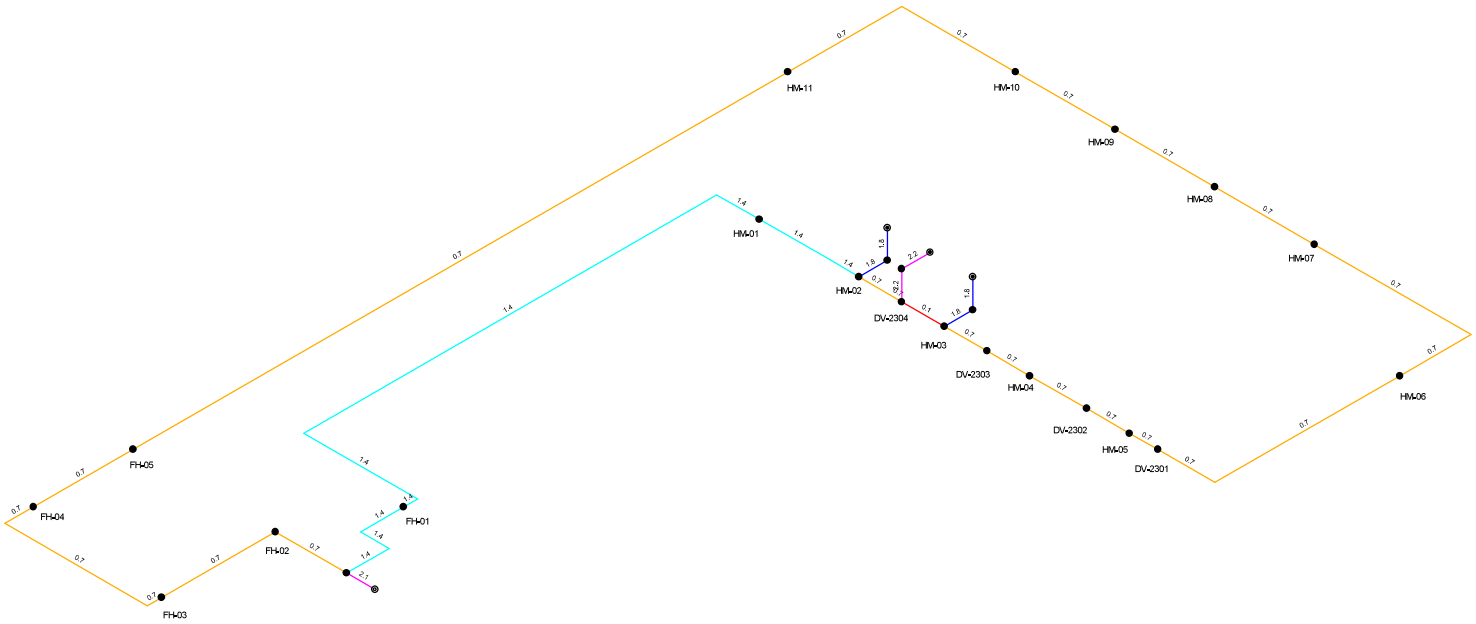
ATTACHMENTS

Att.1.1



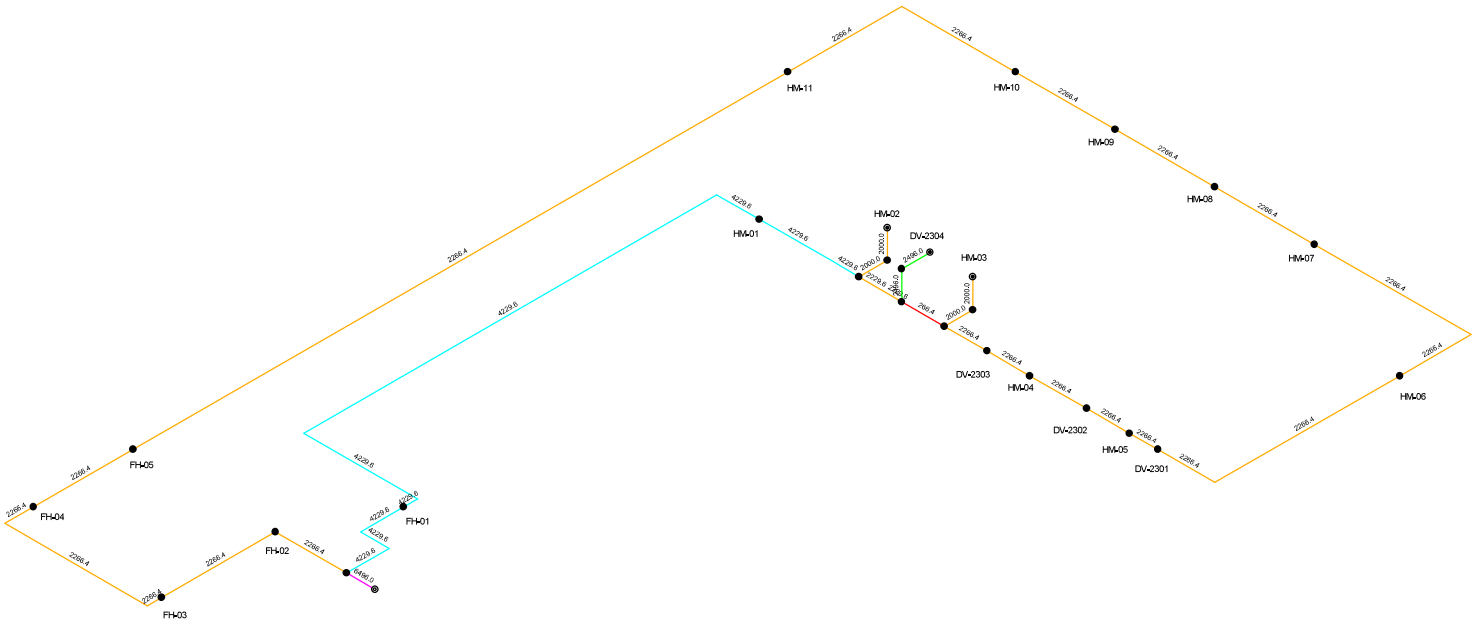
Fire Water Hydraulic Calculation		
PIPENET Schematic	Wednesday, September 07, 2022	Page 1 of 1

Pipe bore (in)			
	< 6.750000	< 7.500000	< 8.250000
	< 9.000000	< 9.750000	> 9.750000

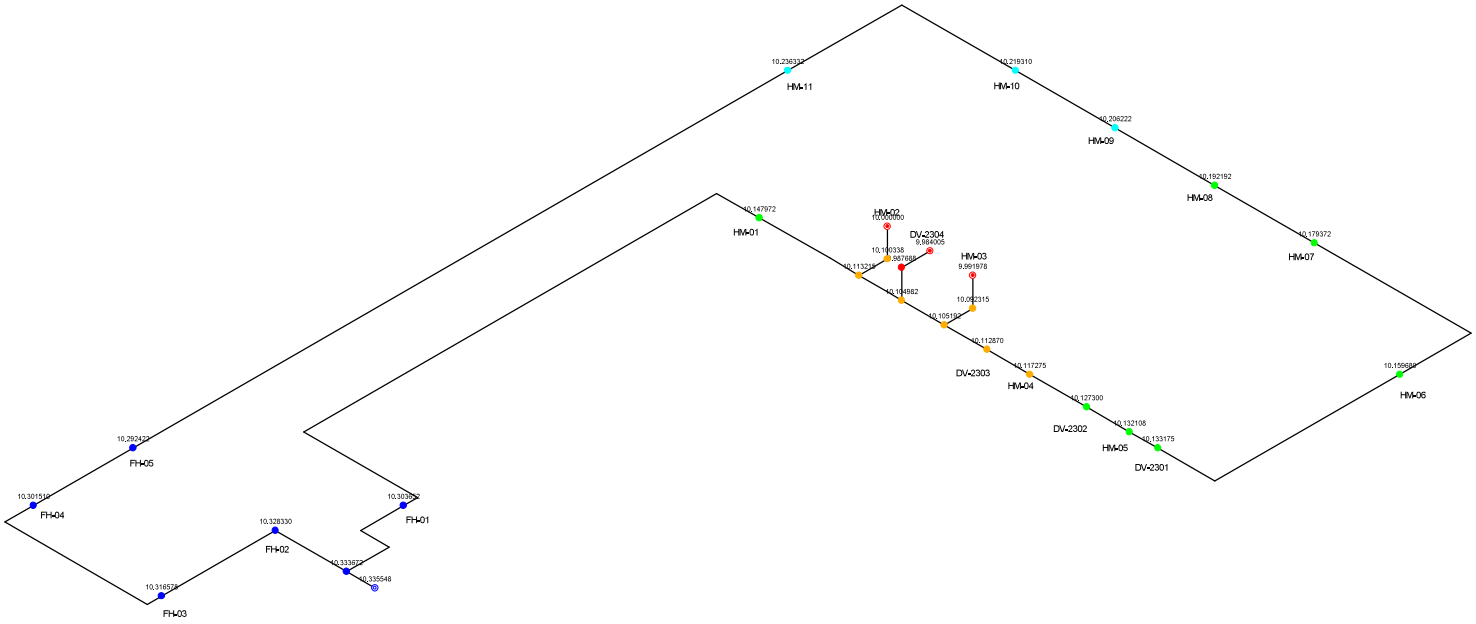


Fire Water Hydraulic Calculation		
PIPENET Schematic	Wednesday, September 07, 2022	Page 1 of 1

Pipe velocity (m/sec)			
	< 0.400000	< 0.800000	< 1.200000
	< 1.600000	< 2.000000	> 2.000000



Fire Water Hydraulic Calculation		
PIPENET Schematic	Wednesday, September 07, 2022	Page 1 of 1
Pipe vol. flow (l/min)	< 1200.000000 < 2400.000000 < 3600.000000 < 4800.000000 < 6000.000000 > 6000.000000	



Fire Water Hydraulic Calculation			
PIPENET Schematic	Wednesday, September 07, 2022		Page 1 of 1
Pressure (Bar G)	< 10.050000	< 10.125000	< 10.200000
	< 10.275000	< 10.350000	> 10.350000

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PIPENET SPRAY/SPRINKLER MODULE

==========

VERSION 1.8

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Results for : Fire Water Hydraulic Calculation
Gas Compressor Station
05/11/2022

Licence Owner from key:

Licence Type: UNKNOWN

Key number: Unavailable

MUS Date: Unavailable

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09:14 on 7-Sep-2022

LIST OF CONTENTS

1

CONTROL INFORMATION

```
Convergence accuracy      = 1.00E-03
Maximum no. of iterations =    50
Elevation Check Tolerance =     0.50 metres
Warnings Control Option   =     0
****** Diagnostic level   =     2
```

FLUID SYSTEM

```
Fluid Class          =  1 (Liquid             )
Density              =   998.2     kg/cu.m
Viscosity            =  1.0000E-03 Pa.s
```

1

DESIGN INFORMATION

Waterspray System

Pipe Materials are :

Pipe Type	Lining Type	Thickness(inches)
3 -- ANSI B36.10 Sch.40	Not Lined	

Design to NFPA 2013 Rules
Using the Hazen-Williams Equation

Velocity Pressure Model: Ignore velocity pressure

Pressure loss at entrance: Ignore

Pressure loss at exit: Ignore

1

AVAILABLE PIPE SIZES AND MAXIMUM VELOCITIES USED FOR PIPE SIZING

ANSI B36.10 Sch.40
Not lined

Nom.Bore (inches)	Act.Diam (inches)	Max.Vel. (m/sec)	Nom.Bore (inches)	Act.Diam (inches)	Max.Vel. (m/sec)	Nom.Bore (inches)	Act.Diam (inches)	Max.Vel. (m/sec)
0.6250	0.6220	4.0000						
0.7500	0.8240	4.0000						
1.0000	1.0490	4.0000						
1.2500	1.3800	4.0000						
1.5000	1.6100	4.0000						
2.0000	2.0670	4.0000						
2.5000	2.4690	4.0000						
3.0000	3.0680	4.0000						
3.5000	3.5480	4.0000						
4.0000	4.0260	4.0000						
5.0000	5.0470	4.0000						
6.0000	6.0650	4.0000						
8.0000	7.9810	4.0000						
10.0000	10.0200	4.0000						
12.0000	11.9380	4.0000						
14.0000	13.1240	4.0000						
16.0000	15.0000	4.0000						
18.0000	16.8760	4.0000						
20.0000	18.8120	4.0000						
24.0000	22.6240	4.0000						

PIPE CONFIGURATION

Pipe Label	Input Node	Output Node	Nom.Bore (inches)	Length (metres)	Elevation (metres)	C Factor	Fitt.eq.lnth (metres)
1	1	2	10.000	1.0000	0.000	120.0	0.000
2	2	3	10.000	20.00	0.000	120.0	0.000
3	3	4	10.000	44.00	0.000	120.0	0.000
4	4	5	10.000	43.00	0.000	120.0	13.41
5	5	6	10.000	32.50	0.000	120.0	1.524
6	6	7	10.000	210.0	0.000	120.0	0.000
7	7	8	10.000	55.50	0.000	120.0	8.230
8	8	9	10.000	49.00	0.000	120.0	0.000
9	9	10	10.000	51.00	0.000	120.0	1.524

10	10	11	10.000	48.00	0.000	120.0
0.000						
11	11	12	10.000	65.50	0.000	120.0
8.230						
12	20	13	6.000	1.0000	1.0000	120.0
4.267						
13	12	14	10.000	91.00	0.000	120.0
8.230						
14	14	15	10.000	4.000	0.000	120.0
0.000						
15	15	16	10.000	18.00	0.000	120.0
0.000						
16	16	17	10.000	36.00	0.000	120.0
1.524						
17	17	18	10.000	16.50	0.000	120.0
0.000						
18	18	19	10.000	13.50	0.000	120.0
15.24						
19	19	20	10.000	24.50	0.000	120.0
16.76						
20	21	20	10.000	16.50	0.000	120.0
15.24						
21	23	21	10.000	41.00	0.000	120.0
0.000						
22	13	22	6.000	1.0000	0.000	120.0
0.000						
23	24	23	10.000	162.0	0.000	120.0
21.64						
24	2	24	10.000	22.00	0.000	120.0
13.41						
25	21	25	6.000	1.0000	0.000	120.0
4.267						
26	25	26	6.000	1.0000	1.0000	120.0
0.000						
27	19	27	6.000	1.0000	0.000	120.0
4.267						
28	27	28	6.000	1.0000	1.0000	120.0
0.000						

PIPE FITTINGS

Pipe Label	Number x Type	Equivalent Length (metres)			
4	2 x 2	6.706			
5	1 x 5	1.524			
7	1 x 2	6.706	1 x 5	1.524	
9	1 x 5	1.524			
11	1 x 2	6.706	1 x 5	1.524	
12	1 x 2	4.267			
13	1 x 2	6.706	1 x 5	1.524	

1

PIPE FITTINGS

Pipe Label	Number x Type	Equivalent Length (metres)			

16	1 x 5	1.524			
18	1 x 4	15.24			
19	1 x 4	15.24	1 x 5	1.524	
20	1 x 4	15.24			
23	3 x 2	6.706	1 x 5	1.524	
24	2 x 2	6.706			
25	1 x 2	4.267			
27	1 x 2	4.267			

Fitting types are :
1 -- 45 Deg Elbow
2 -- 90 Deg Standard Elbow
3 -- 90 Deg Long Radius Elbow
4 -- Tee or Cross (Flow Turned Thro 90 Deg)
5 -- Gate Valve
6 -- Swing Check Valve
7 -- Non-Return Valve
8 -- Ball Valve
9 -- Butterfly Valve
1

DESIGNED DIAMETERS & FLOWRATES

Pipe Label	Input Node	Output Node	Flowrate (lit/min)	Pipe Type	Act. Bore (inches)	Nom. Size (inches)	Pipe Group
1	1	2	6496.0146	3	10.0200	10.0000	*
2	2	3	2266.3787	3	10.0200	10.0000	*
3	3	4	2266.3787	3	10.0200	10.0000	*
4	4	5	2266.3787	3	10.0200	10.0000	*
5	5	6	2266.3787	3	10.0200	10.0000	*
6	6	7	2266.3787	3	10.0200	10.0000	*
7	7	8	2266.3787	3	10.0200	10.0000	*
8	8	9	2266.3787	3	10.0200	10.0000	*
9	9	10	2266.3787	3	10.0200	10.0000	*
10	10	11	2266.3787	3	10.0200	10.0000	*
11	11	12	2266.3787	3	10.0200	10.0000	*
12	20	13	2496.0059	3	6.0650	6.0000	*
13	12	14	2266.3787	3	10.0200	10.0000	*
14	14	15	2266.3787	3	10.0200	10.0000	*
15	15	16	2266.3787	3	10.0200	10.0000	*
16	16	17	2266.3787	3	10.0200	10.0000	*
17	17	18	2266.3787	3	10.0200	10.0000	*
18	18	19	2266.3787	3	10.0200	10.0000	*
19	19	20	266.3742	3	10.0200	10.0000	*
20	21	20	2229.6316	3	10.0200	10.0000	*
21	23	21	4229.6362	3	10.0200	10.0000	*
22	13	22	2496.0059	3	6.0650	6.0000	*
23	24	23	4229.6362	3	10.0200	10.0000	*
24	2	24	4229.6362	3	10.0200	10.0000	*
25	21	25	2000.0045	3	6.0650	6.0000	*
26	25	26	2000.0045	3	6.0650	6.0000	*
27	19	27	2000.0045	3	6.0650	6.0000	*
28	27	28	2000.0045	3	6.0650	6.0000	*

A * indicates that this is a SET diameter

Pipe Materials are :

Pipe Type	Lining Type	Thickness(inches)

FLOW IN PIPES

Pipe Label	Input Node	Output Node	Nom.Bore (inches)	Inlet Pr. (bar G)	Outlet Pr. (bar G)	Drop in Pr. (bar)	Frict. Loss (bar)	Flowrate (lit/min)	Velocity (m/sec)
1	1	2	10.00	10.34	10.33	1.8749E-03	1.8749E-03	6496.	2.128
2	2	3	10.00	10.33	10.33	5.3425E-03	5.3425E-03	2266.	0.7425
3	3	4	10.00	10.33	10.32	1.1752E-02	1.1752E-02	2266.	0.7425
4	4	5	10.00	10.32	10.30	1.5068E-02	1.5068E-02	2266.	0.7425
5	5	6	10.00	10.30	10.29	9.0876E-03	9.0876E-03	2266.	0.7425
6	6	7	10.00	10.29	10.24	5.6089E-02	5.6089E-02	2266.	0.7425
7	7	8	10.00	10.24	10.22	1.7023E-02	1.7023E-02	2266.	0.7425
8	8	9	10.00	10.22	10.21	1.3087E-02	1.3087E-02	2266.	0.7425
9	9	10	10.00	10.21	10.19	1.4030E-02	1.4030E-02	2266.	0.7425
10	10	11	10.00	10.19	10.18	1.2819E-02	1.2819E-02	2266.	0.7425
11	11	12	10.00	10.18	10.16	1.9692E-02	1.9692E-02	2266.	0.7425
12	20	13	6.00	10.10	9.988	0.1173	1.9402E-02	2496.	2.232
13	12	14	10.00	10.16	10.13	2.6505E-02	2.6505E-02	2266.	0.7425
14	14	15	10.00	10.13	10.13	1.0672E-03	1.0672E-03	2266.	0.7425
15	15	16	10.00	10.13	10.13	4.8075E-03	4.8075E-03	2266.	0.7425
16	16	17	10.00	10.13	10.12	1.0025E-02	1.0025E-02	2266.	0.7425
17	17	18	10.00	10.12	10.11	4.4050E-03	4.4050E-03	2266.	0.7425
18	18	19	10.00	10.11	10.11	7.6780E-03	7.6780E-03	2266.	0.7425
19	19	20	10.00	10.11	10.10	2.0981E-04	2.0981E-04	266.4	8.7266E-02
20	21	20	10.00	10.11	10.10	8.2331E-03	8.2331E-03	2230.	0.7304
21	23	21	10.00	10.15	10.11	3.4757E-02	3.4757E-02	4230.	1.386
22	13	22	6.00	9.988	9.984	3.6821E-03	3.6821E-03	2496.	2.232
23	24	23	10.00	10.30	10.15	0.1557	0.1557	4230.	1.386
24	2	24	10.00	10.33	10.30	3.0020E-02	3.0020E-02	4230.	1.386
25	21	25	6.00	10.11	10.10	1.2878E-02	1.2878E-02	2000.	1.788

26	25	26	6.00	10.10	10.000	0.1003	2.4437E-03
2000.	1.788						
27	19	27	6.00	10.11	10.09	1.2877E-02	1.2877E-02
2000.	1.788						
28	27	28	6.00	10.09	9.992	0.1003	2.4437E-03
2000.	1.788						

1

FLOW AT INLETS

Inlet Node	Pressure (bar G)	Flowrate (lit/min)	Equivalent K-factor (lit/min, bar G)
1	10.34	6496.	2020.6

Note: A * after a value indicates that this is a specification

1

FLOW AT OUTLETS

Outlet Node	Pressure (bar G)		Flowrate (lit/min)		Equivalent K-factor (lit/min, bar G)
22	9.984		2496.	*	789.94
26	10.000	*	2000.	*	632.46
28	9.992		2000.	*	632.71

Note: A * after a value indicates that this is a specification

1

Materials Take-off

Pipe lengths

ANSI B36.10 Sch.40

Nom. Size (inches)	Tot. Length (metres)	Nom. Size (inches)	Tot. Length (metres)	Nom. Size (inches)	Tot. Length (metres)	Nom. Size (inches)	Tot. Length (metres)	Nom. Size (inches)	Tot. Length (metres)

6.000 6.000
10.000 1064.
1

Materials Take Off

Fittings

Fitting Nominal Size (inches)	Fitting Type 1	2	3	4	5	6	7	8	9
6.000	0	3	0	0	0	0	0	0	0
10.000	0	10	0	3	8	0	0	0	0

Fitting Types are :

1 -- 45 Deg Elbow	4 -- Tee or Cross	7 -- Non-Return Valve
2 -- 90 Deg Standard Elbow	5 -- Gate Valve	8 -- Ball Valve
3 -- 90 Deg Long Radius Elbow	6 -- Swing Check Valve	9 -- Butterfly Valve

All fittings are as specified by user - no additional fittings have been generated automatically.

The supply demand graph is not available for the network without pump
1

IMPORTANT NOTICE

Your attention is drawn to the need to maintain adequate standards. SUNRISE SYSTEMS Ltd has itself taken steps to ensure that this program produces valid results when properly used. Users are reminded of their responsibilities in the application of program results and, in particular, you should ensure that pertinent output documents are examined and approved by qualified staff prior to use.

1

COMMENTS

Analysis Converged in 6 Iterations
1

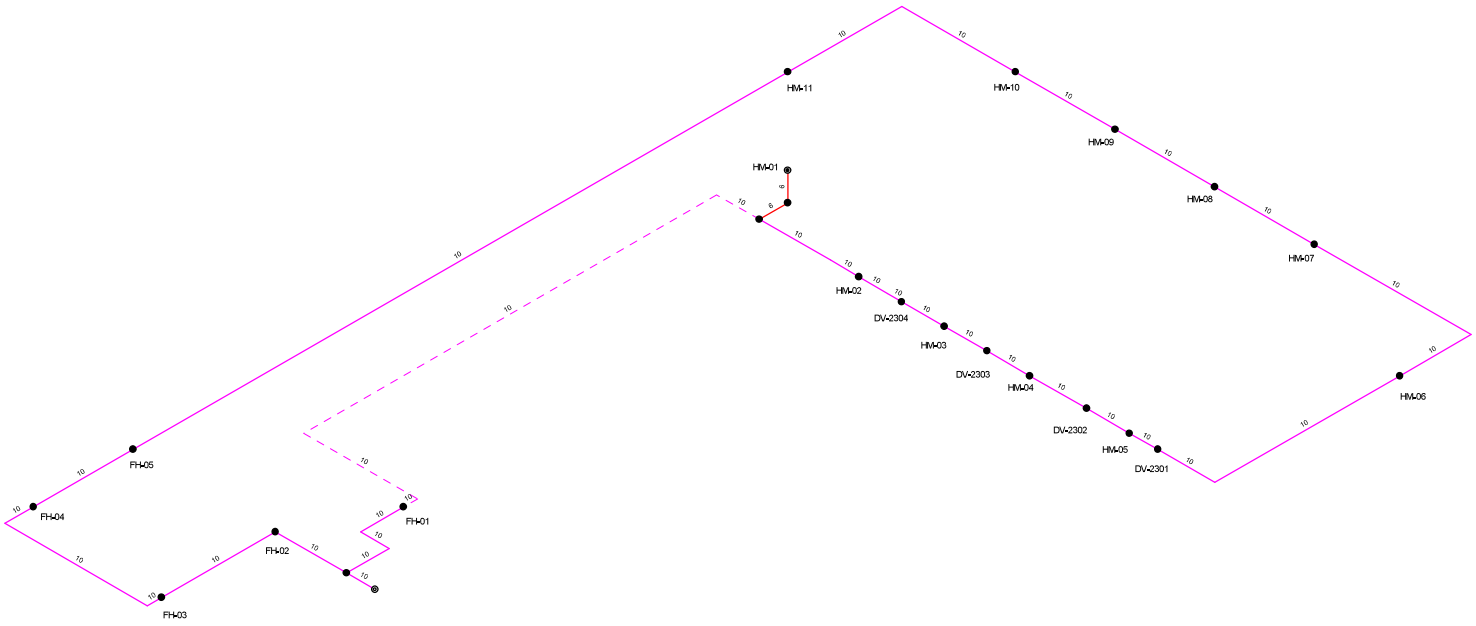
==========

==========

Fire Water Hydraulic Calculation
Gas Compressor Station
05/11/2022

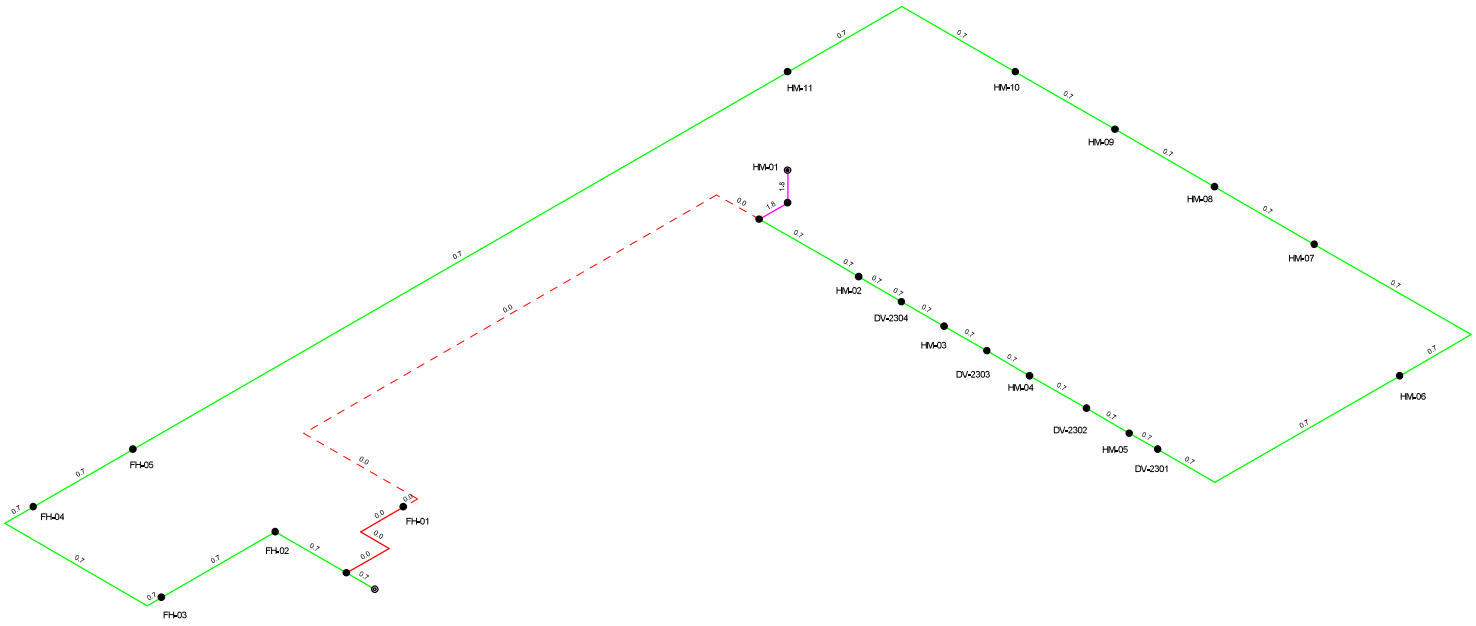
==========
==========

Att.1.2



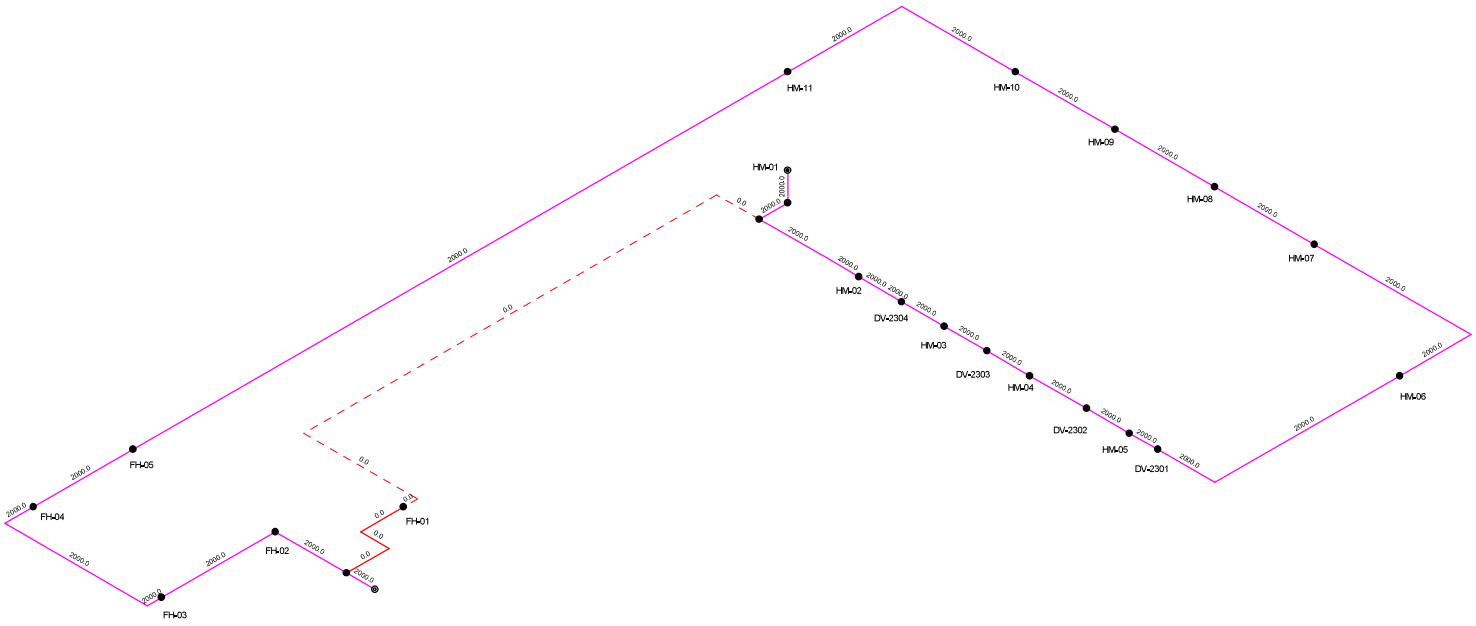
Fire Water Hydraulic Calculation		
PIPENET Schematic	Wednesday, September 07, 2022	Page 1 of 1

Pipe bore (in)			
	< 6.750000	< 7.500000	< 8.250000
	< 9.000000	< 9.750000	> 9.750000

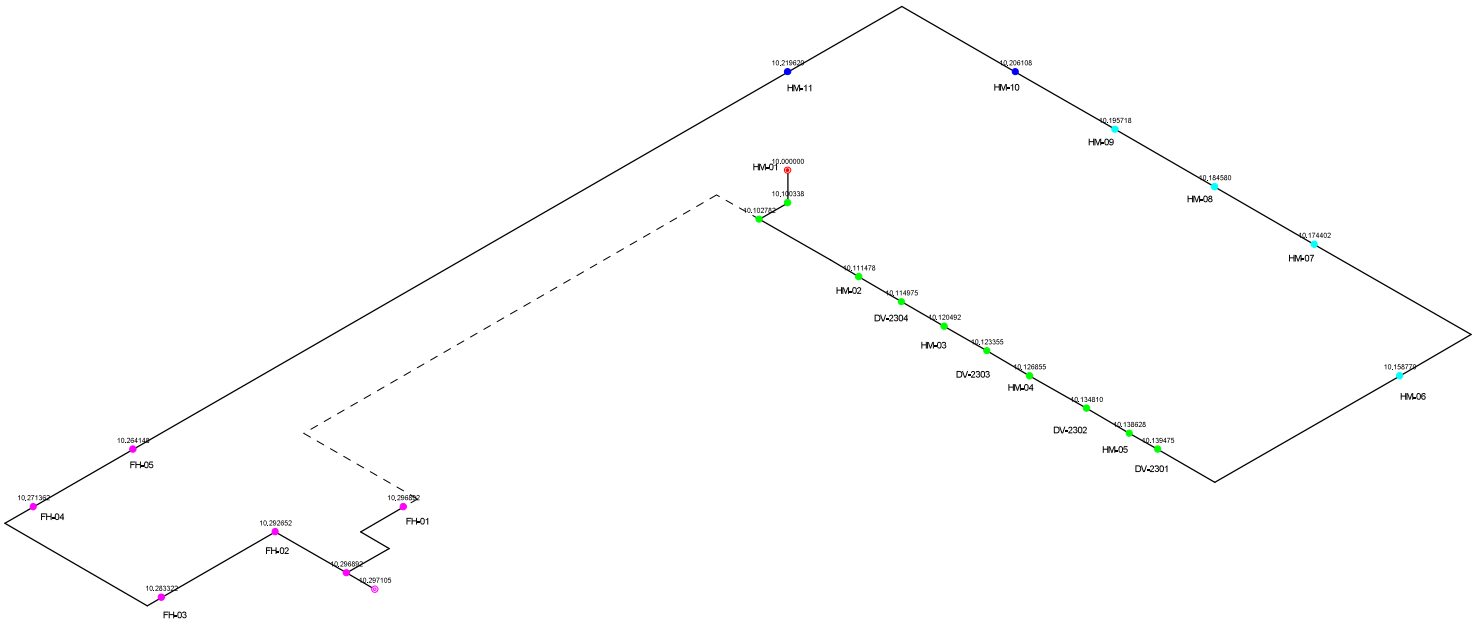


Fire Water Hydraulic Calculation		
PIPENET Schematic	Wednesday, September 07, 2022	Page 1 of 1

Pipe velocity (m/sec)			
	< 0.300000	< 0.600000	< 0.900000
	< 1.200000	< 1.500000	> 1.500000



Fire Water Hydraulic Calculation		
PIPENET Schematic	Wednesday, September 07, 2022	Page 1 of 1
Pipe vol. flow (l/min)	< 400.000000	< 800.000000
	< 1600.000000	< 2000.000000
		< 1200.000000
		> 2000.000000



Fire Water Hydraulic Calculation			
PIPENET Schematic	Wednesday, September 07, 2022		Page 1 of 1
Pressure (Bar G)	< 10.050000	< 10.100000	< 10.150000
	< 10.200000	< 10.250000	> 10.250000

==========

PIPENET SPRAY/SPRINKLER MODULE

==========

VERSION 1.8

==========

Results for : Fire Water Hydraulic Calculation
Gas Compressor Station
05/11/2022

Licence Owner from key:

Licence Type: UNKNOWN

Key number: Unavailable

MUS Date: Unavailable

==========

09:26 on 7-Sep-2022

LIST OF CONTENTS

1

CONTROL INFORMATION

```
   Convergence accuracy      = 1.00E-03
   Maximum no. of iterations =    50
   Elevation Check Tolerance =     0.50 metres
   Warnings Control Option   =     0
   ****** Diagnostic level   =     2
```

FLUID SYSTEM

```
   Fluid Class          =  1 (Liquid             )
   Density              =   998.2     kg/cu.m
   Viscosity            =  1.0000E-03 Pa.s
```

1

DESIGN INFORMATION

Waterspray System

Pipe Materials are :

Pipe Type	Lining Type	Thickness(inches)
3 -- ANSI B36.10 Sch.40	Not Lined	

Design to NFPA 2013 Rules
Using the Hazen-Williams Equation

Velocity Pressure Model: Ignore velocity pressure

Pressure loss at entrance: Ignore

Pressure loss at exit: Ignore

1

AVAILABLE PIPE SIZES AND MAXIMUM VELOCITIES USED FOR PIPE SIZING

ANSI B36.10 Sch.40
Not lined

Nom.Bore (inches)	Act.Diam (inches)	Max.Vel. (m/sec)	Nom.Bore (inches)	Act.Diam (inches)	Max.Vel. (m/sec)	Nom.Bore (inches)	Act.Diam (inches)	Max.Vel. (m/sec)
0.6250	0.6220	4.0000						
0.7500	0.8240	4.0000						
1.0000	1.0490	4.0000						
1.2500	1.3800	4.0000						
1.5000	1.6100	4.0000						
2.0000	2.0670	4.0000						
2.5000	2.4690	4.0000						
3.0000	3.0680	4.0000						
3.5000	3.5480	4.0000						
4.0000	4.0260	4.0000						
5.0000	5.0470	4.0000						
6.0000	6.0650	4.0000						
8.0000	7.9810	4.0000						
10.0000	10.0200	4.0000						
12.0000	11.9380	4.0000						
14.0000	13.1240	4.0000						
16.0000	15.0000	4.0000						
18.0000	16.8760	4.0000						
20.0000	18.8120	4.0000						
24.0000	22.6240	4.0000						

PIPE CONFIGURATION

Pipe Label	Input Node	Output Node	Nom.Bore (inches)	Length (metres)	Elevation (metres)	C Factor	Fitt.eq.lnth (metres)
1	1	2	10.000	1.0000	0.000	120.0	0.000
2	2	3	10.000	20.00	0.000	120.0	0.000
3	3	4	10.000	44.00	0.000	120.0	0.000
4	4	5	10.000	43.00	0.000	120.0	13.41
5	5	6	10.000	32.50	0.000	120.0	1.524
6	6	7	10.000	210.0	0.000	120.0	0.000
7	7	8	10.000	55.50	0.000	120.0	8.230
8	8	9	10.000	49.00	0.000	120.0	0.000

9	9	10	10.000	51.00	0.000	120.0	1.524
10	10	11	10.000	48.00	0.000	120.0	0.000
11	11	12	10.000	65.50	0.000	120.0	8.230
12	23	13	6.000	1.0000	0.000	120.0	0.000
13	12	14	10.000	91.00	0.000	120.0	0.000
14	14	15	10.000	4.000	0.000	120.0	0.000
15	15	16	10.000	18.00	0.000	120.0	0.000
16	16	17	10.000	36.00	0.000	120.0	1.524
17	17	18	10.000	16.50	0.000	120.0	0.000
18	18	19	10.000	13.50	0.000	120.0	0.000
19	19	20	10.000	24.50	0.000	120.0	1.524
20	20	21	10.000	16.50	0.000	120.0	0.000
21	21	23	10.000	41.00	0.000	120.0	0.000
22	13	22	6.000	1.0000	1.0000	120.0	0.000
23	23	24	10.000	162.0	0.000	120.0	21.64 $
24	24	2	10.000	22.00	0.000	120.0	13.41

NOTE: a $ indicates a BLOCKED Pipe

PIPE FITTINGS

Pipe Label	Number x Type	Equivalent Length (metres)			
4	2 x 2	6.706			
5	1 x 5	1.524			
7	1 x 2	6.706	1 x 5	1.524	
9	1 x 5	1.524			
11	1 x 2	6.706	1 x 5	1.524	
16	1 x 5	1.524			
19	1 x 5	1.524			
23	3 x 2	6.706	1 x 5	1.524	
24	2 x 2	6.706			

Fitting types are :
1 -- 45 Deg Elbow
2 -- 90 Deg Standard Elbow
3 -- 90 Deg Long Radius Elbow
4 -- Tee or Cross (Flow Turned Thro 90 Deg)
5 -- Gate Valve
6 -- Swing Check Valve
7 -- Non-Return Valve
8 -- Ball Valve
9 -- Butterfly Valve

DESIGNED DIAMETERS & FLOWRATES

Pipe Label	Input Node	Output Node	Flowrate (lit/min)	Pipe Type	Act. Bore (inches)	Nom. Size (inches)	Pipe Group
1	1	2	2000.0048	3	10.0200	10.0000	*
2	2	3	2000.0048	3	10.0200	10.0000	*
3	3	4	2000.0048	3	10.0200	10.0000	*
4	4	5	2000.0048	3	10.0200	10.0000	*
5	5	6	2000.0048	3	10.0200	10.0000	*
6	6	7	2000.0048	3	10.0200	10.0000	*
7	7	8	2000.0048	3	10.0200	10.0000	*
8	8	9	2000.0048	3	10.0200	10.0000	*
9	9	10	2000.0048	3	10.0200	10.0000	*
10	10	11	2000.0048	3	10.0200	10.0000	*
11	11	12	2000.0048	3	10.0200	10.0000	*
12	23	13	2000.0045	3	6.0650	6.0000	*
13	12	14	2000.0048	3	10.0200	10.0000	*
14	14	15	2000.0048	3	10.0200	10.0000	*
15	15	16	2000.0048	3	10.0200	10.0000	*
16	16	17	2000.0048	3	10.0200	10.0000	*
17	17	18	2000.0048	3	10.0200	10.0000	*
18	18	19	2000.0048	3	10.0200	10.0000	*
19	19	20	2000.0048	3	10.0200	10.0000	*
20	20	21	2000.0048	3	10.0200	10.0000	*
21	21	23	2000.0048	3	10.0200	10.0000	*
22	13	22	2000.0045	3	6.0650	6.0000	*
23	23	24	0.0000	3	10.0200	10.0000	*
24	24	2	0.0000	3	10.0200	10.0000	*

A * indicates that this is a SET diameter

Pipe Materials are :

Pipe Type	Lining Type	Thickness(inches)
3 -- ANSI B36.10 Sch.40	Not Lined	

FLOW IN PIPES

Pipe Label	Input Node	Output Node	Nom.Bore (inches)	Inlet Pr. (bar G)	Outlet Pr. (bar G)	Drop in Pr. (bar)	Frict. Loss (bar)	Flowrate (lit/min)	Velocity (m/sec)
1	1	2	10.00	10.30	10.30	2.1267E-04	2.1267E-04	2000.	0.6552
2	2	3	10.00	10.30	10.29	4.2400E-03	4.2400E-03		

2000.	0.6552							
3	3	4	10.00	10.29	10.28	9.3298E-03	9.3298E-03	
2000.	0.6552							
4	4	5	10.00	10.28	10.27	1.1960E-02	1.1960E-02	
2000.	0.6552							
5	5	6	10.00	10.27	10.26	7.2145E-03	7.2145E-03	
2000.	0.6552							
6	6	7	10.00	10.26	10.22	4.4528E-02	4.4528E-02	
2000.	0.6552							
7	7	8	10.00	10.22	10.21	1.3513E-02	1.3513E-02	
2000.	0.6552							
8	8	9	10.00	10.21	10.20	1.0389E-02	1.0389E-02	
2000.	0.6552							
9	9	10	10.00	10.20	10.18	1.1138E-02	1.1138E-02	
2000.	0.6552							
10	10	11	10.00	10.18	10.17	1.0178E-02	1.0178E-02	
2000.	0.6552							
11	11	12	10.00	10.17	10.16	1.5633E-02	1.5633E-02	
2000.	0.6552							
12	23	13	6.00	10.10	10.10	2.4452E-03	2.4452E-03	
2000.	1.788							
13	12	14	10.00	10.16	10.14	1.9295E-02	1.9295E-02	
2000.	0.6552							
14	14	15	10.00	10.14	10.14	8.4782E-04	8.4782E-04	
2000.	0.6552							
15	15	16	10.00	10.14	10.13	3.8166E-03	3.8166E-03	
2000.	0.6552							
16	16	17	10.00	10.13	10.13	7.9556E-03	7.9556E-03	
2000.	0.6552							
17	17	18	10.00	10.13	10.12	3.5000E-03	3.5000E-03	
2000.	0.6552							
18	18	19	10.00	10.12	10.12	2.8620E-03	2.8620E-03	
2000.	0.6552							
19	19	20	10.00	10.12	10.11	5.5180E-03	5.5180E-03	
2000.	0.6552							
20	20	21	10.00	10.11	10.11	3.4971E-03	3.4971E-03	
2000.	0.6552							
21	21	23	10.00	10.11	10.10	8.6956E-03	8.6956E-03	
2000.	0.6552							
22	13	22	6.00	10.10	10.000	0.1003	2.4437E-03	
2000.	1.788							
23	23	24	10.00	10.10	10.30	-0.1941	0.1941	
0.000	0.000	$						
24	24	2	10.00	10.30	10.30	0.000	0.000	
0.000	0.000							

NOTE: A $ indicates a Blocked Pipe - Pressures may not be meaningful.
1

FLOW AT INLETS

Inlet Node	Pressure (bar G)	Flowrate (lit/min)	Equivalent K-factor (lit/min , bar G)
1	10.30	2000.	623.26

Note: A * after a value indicates that this is a specification

** WARNING : There are Broken or Blocked Pipes in the Network.
1

FLOW AT OUTLETS

Outlet Node	Pressure (bar G)	Flowrate (lit/min)	Equivalent K-factor (lit/min , bar G)
22	10.000 *	2000. *	632.46

Note: A * after a value indicates that this is a specification

** WARNING : There are Broken or Blocked Pipes in the Network.
1

FLOWS AND PRESSURES AT BREAKS AND BLOCKS

Pipe Label	Status	Node	Flowrates (lit/min)		Pressures (bar G)	
23	Blocked at node	24	0.00 *	0.00 *	10.3	10.1

NOTE: A * after a value indicates a program supplied Specification.
Negative flows are OUT of the network.
1

Materials Take-off

Pipe lengths

ANSI B36.10 Sch.40

Nom. Size (inches)	Tot. Length (metres)	Nom. Size (inches)	Tot. Length (metres)	Nom. Size (inches)	Tot. Length (metres)	Nom. Size (inches)	Tot. Length (metres)	Nom. Size (inches)	Tot. Length (metres)
6.000	2.000								
10.000	1064.								

1

Materials Take Off

Fittings

Fitting Nominal Size (inches)	Fitting Type 1	2	3	4	5	6	7	8	9
10.000	0	9	0	0	7	0	0	0	0

Fitting Types are :

1 -- 45 Deg Elbow	4 -- Tee or Cross	7 -- Non-Return Valve
2 -- 90 Deg Standard Elbow	5 -- Gate Valve	8 -- Ball Valve
3 -- 90 Deg Long Radius Elbow	6 -- Swing Check Valve	9 -- Butterfly Valve

All fittings are as specified by user - no additional fittings have been generated automatically.

The supply demand graph is not available for the network without pump
1

IMPORTANT NOTICE

Your attention is drawn to the need to maintain adequate standards. SUNRISE SYSTEMS Ltd has itself taken steps to ensure that this program produces valid results when properly used. Users are reminded of their responsibilities in the application of program results and, in particular, you should ensure that pertinent output documents are examined and approved by qualified staff prior to use.

1

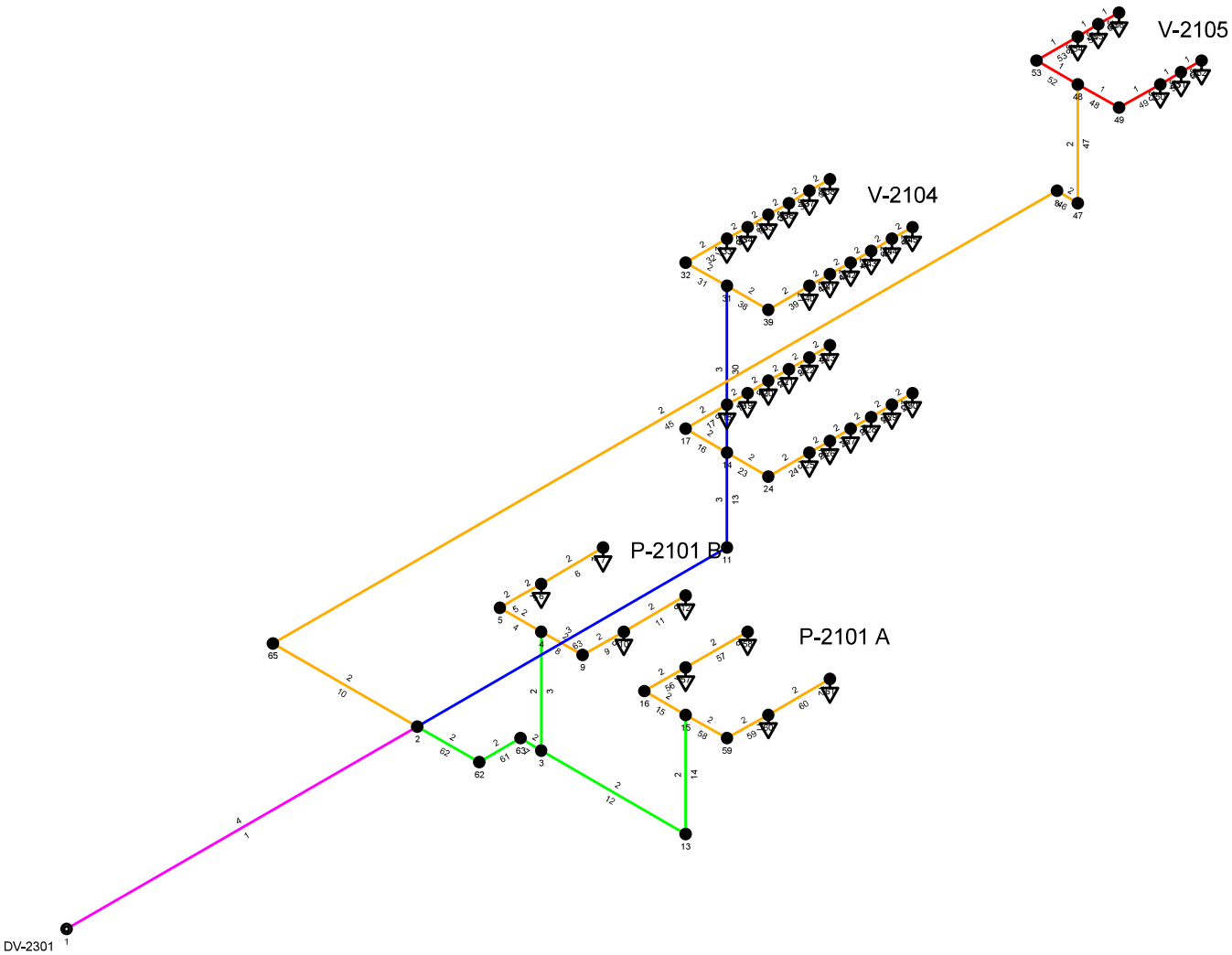
COMMENTS

Analysis Converged in 3 Iterations
1

==========

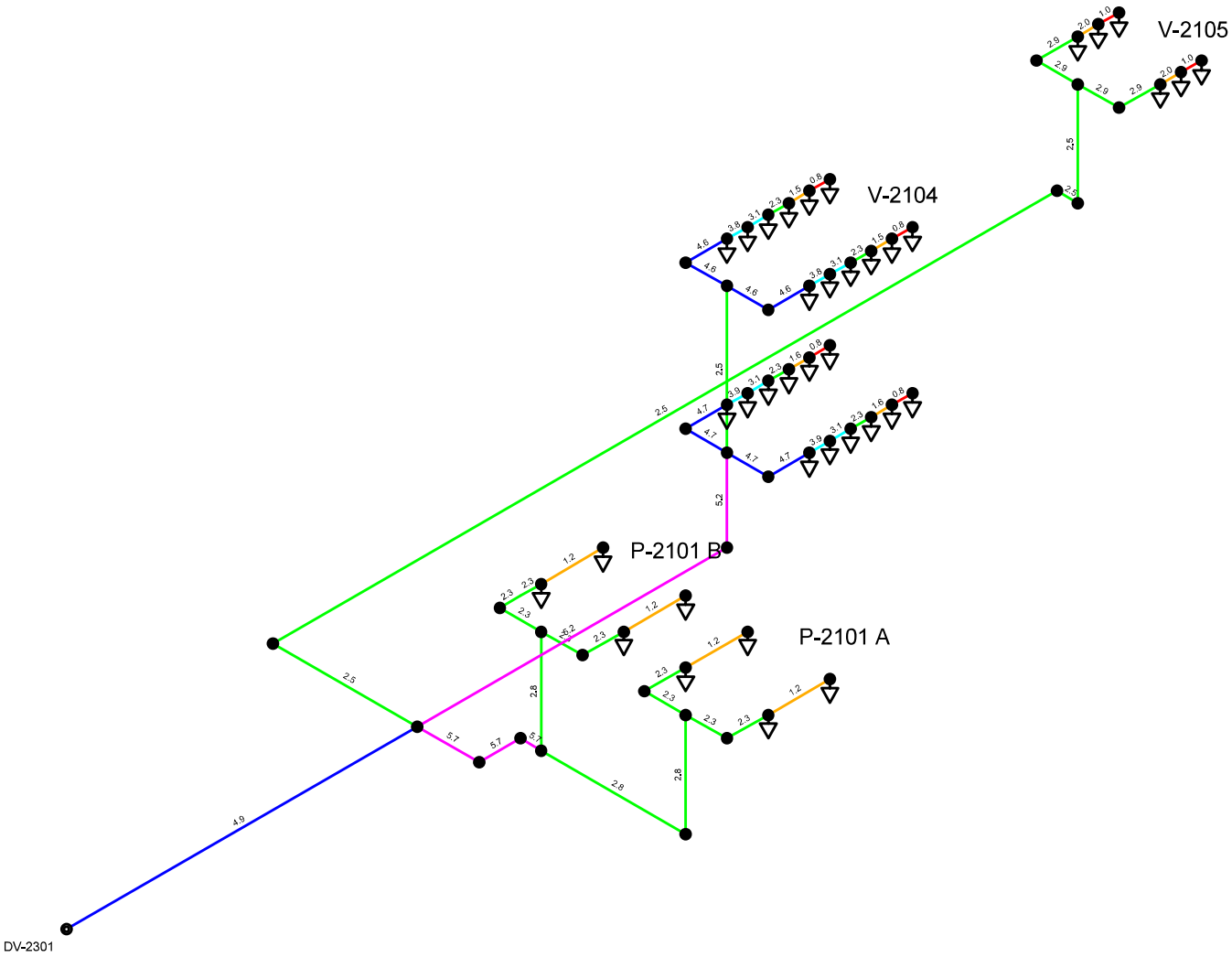
Fire Water Hydraulic Calculation
Gas Compressor Station
05/11/2022

Att.2.1



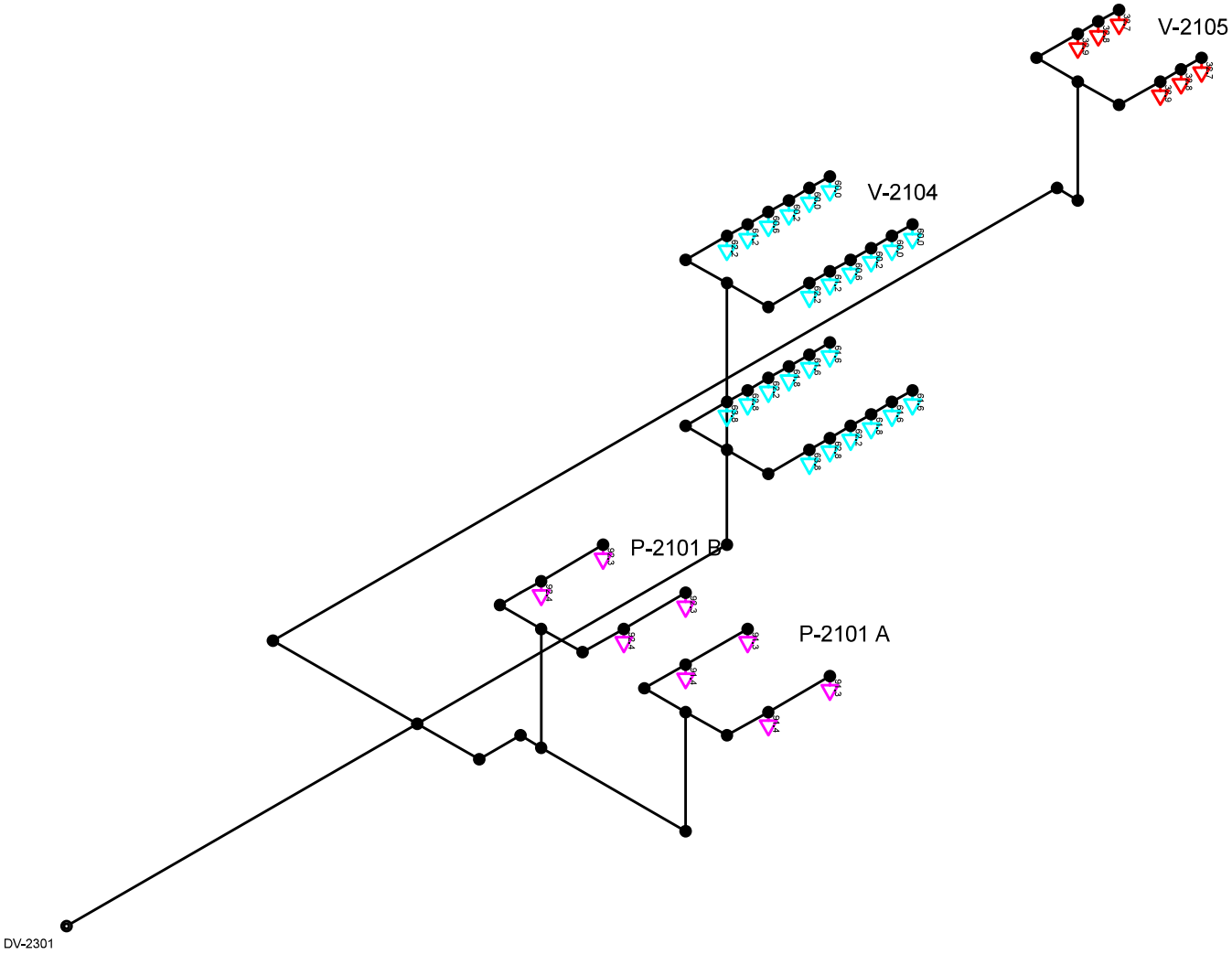
PIPENET Schematic	Tuesday, September 06, 2022	Page 1 of 1

Pipe bore (in)	< 1.500000	< 2.000000	< 2.500000
	< 3.000000	< 3.500000	> 3.500000



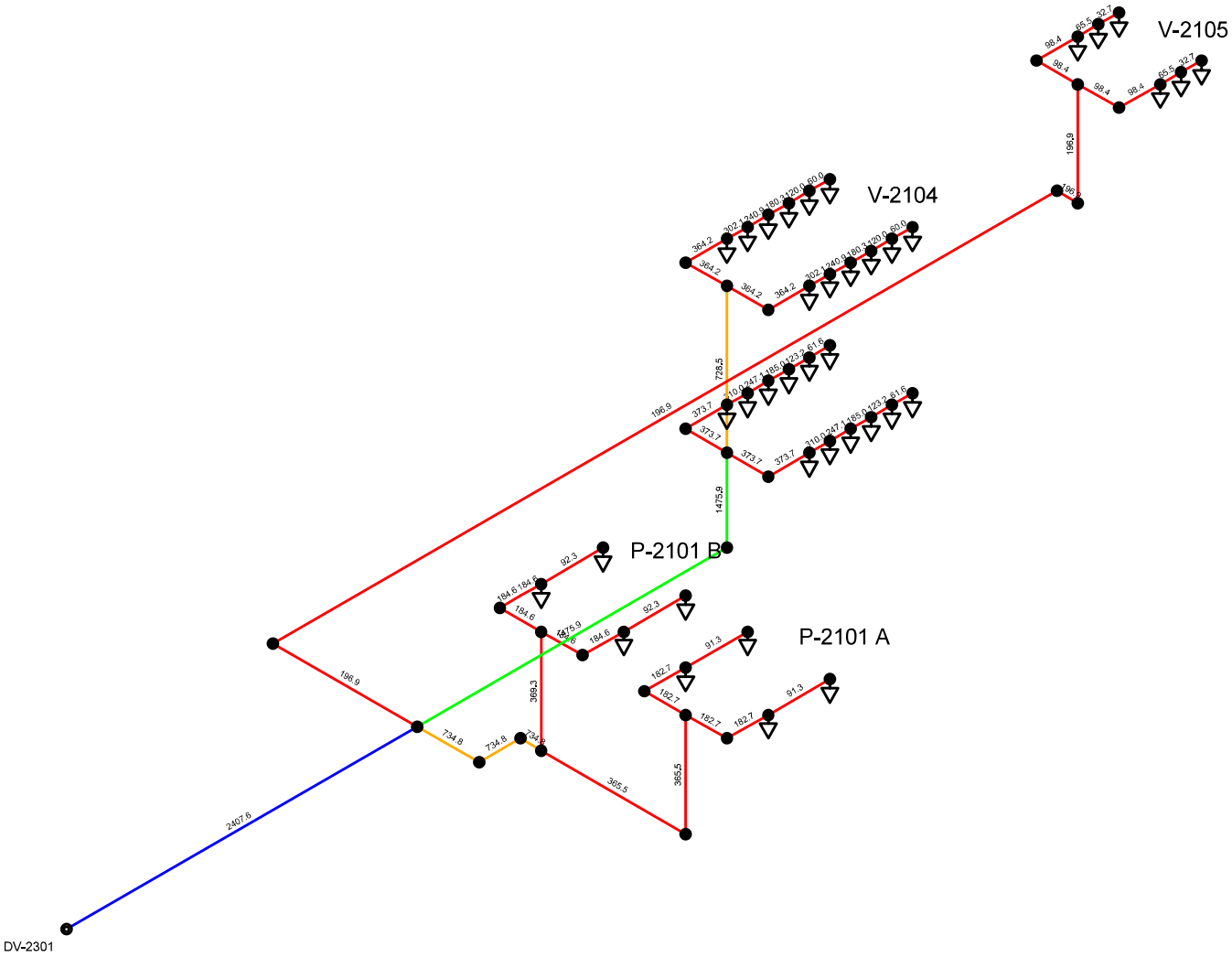
PIPENET Schematic	Tuesday, September 06, 2022	Page 1 of 1

Pipe velocity (m/sec)	< 1.000000	< 2.000000	< 3.000000
	< 4.000000	< 5.000000	> 5.000000



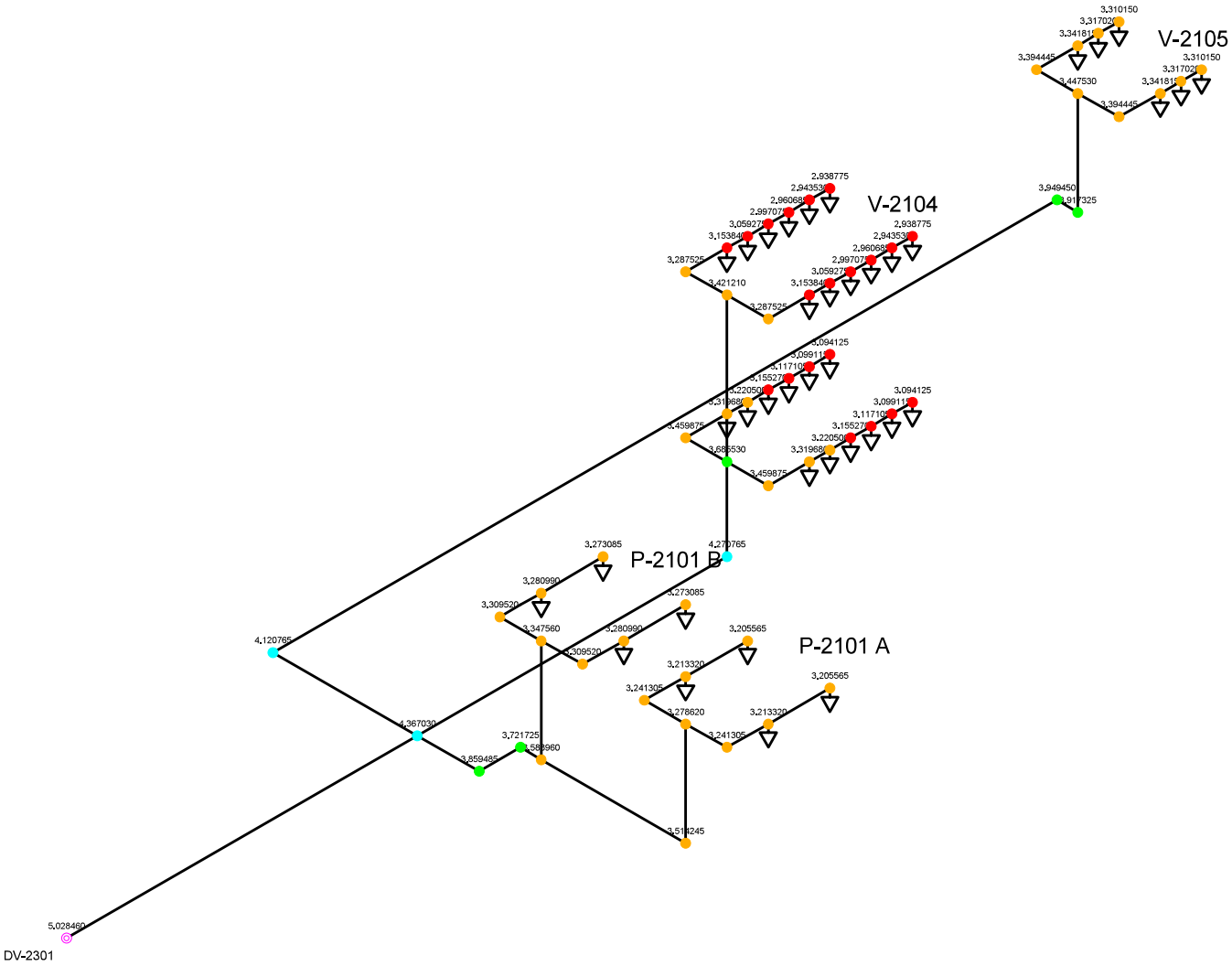
PIPENET Schematic	Tuesday, September 06, 2022	Page 1 of 1

Nozzle calc. flow (l/min)	< 36.000000	< 48.000000	< 60.000000
	< 72.000000	< 84.000000	> 84.000000



PIPENET Schematic	Tuesday, September 06, 2022	Page 1 of 1

Pipe vol. flow (l/min)	< 500.000000	< 1000.000000	< 1500.000000
	< 2000.000000	< 2500.000000	> 2500.000000



PIPENET Schematic	Tuesday, September 06, 2022		Page 1 of 1
Pressure (Bar G)	< 3.200000	< 3.600000	< 4.000000
	< 4.400000	< 4.800000	> 4.800000

==========

PIPENET SPRAY/SPRINKLER MODULE

==========

VERSION 1.8

==========

Results for :

Licence Owner from key:

Licence Type: UNKNOWN

Key number: Unavailable

MUS Date: Unavailable

==========

15:42 on 6-Sep-2022

LIST OF CONTENTS

1

CONTROL INFORMATION

Convergence accuracy = 1.00E-03
Maximum no. of iterations = 50
Elevation Check Tolerance = 0.50 metres
Warnings Control Option = 0
****** Diagnostic level = 2

FLUID SYSTEM

Fluid Class = 1 (Liquid)
Density = 998.2 kg/cu.m
Viscosity = 1.0000E-03 Pa.s

1

DESIGN INFORMATION

Waterspray System

Pipe Materials are :

Pipe Type	Lining Type	Thickness(inches)
3 -- ANSI B36.10 Sch.40	Not Lined	

Design to NFPA 2013 Rules
Using the Hazen-Williams Equation

Velocity Pressure Model: Ignore velocity pressure

Pressure loss at entrance: Ignore

Pressure loss at exit: Ignore

1

AVAILABLE PIPE SIZES AND MAXIMUM VELOCITIES USED FOR PIPE SIZING

ANSI B36.10 Sch.40
Not lined

Nom.Bore (inches)	Act.Diam (inches)	Max.Vel. (m/sec)	Nom.Bore (inches)	Act.Diam (inches)	Max.Vel. (m/sec)	Nom.Bore (inches)	Act.Diam (inches)	Max.Vel. (m/sec)
0.6250	0.6220	4.0000						
0.7500	0.8240	4.0000						
1.0000	1.0490	4.0000						
1.2500	1.3800	4.0000						
1.5000	1.6100	4.0000						
2.0000	2.0670	4.0000						
2.5000	2.4690	4.0000						
3.0000	3.0680	4.0000						
3.5000	3.5480	4.0000						
4.0000	4.0260	4.0000						
5.0000	5.0470	4.0000						
6.0000	6.0650	4.0000						
8.0000	7.9810	4.0000						
10.0000	10.0200	4.0000						
12.0000	11.9380	4.0000						
14.0000	13.1240	4.0000						
16.0000	15.0000	4.0000						
18.0000	16.8760	4.0000						
20.0000	18.8120	4.0000						
24.0000	22.6240	4.0000						

PIPE CONFIGURATION

Pipe Label	Input Node	Output Node	Nom.Bore (inches)	Length (metres)	Elevation (metres)	C Factor	Fitt.eq.lnth (metres)
1	1	2	4.000	20.00	0.000	120.0	6.096
3	3	4	2.000	2.000	2.000	120.0	0.000
4	4	5	1.500	2.000	0.000	120.0	0.000
5	5	6	1.500	1.500	0.000	120.0	0.000
6	6	7	1.500	1.500	0.000	120.0	0.000
7	63	3	2.000	1.900	0.000	120.0	0.000
8	4	9	1.500	2.000	0.000	120.0	0.000

9	9	10	1.500	1.500	0.000	120.0
0.000						
10	2	65	1.500	11.50	0.000	120.0
0.000						
11	10	12	1.500	1.500	0.000	120.0
0.000						
12	3	13	2.000	3.500	0.000	120.0
0.000						
13	11	14	3.000	3.000	3.000	120.0
4.572						
14	13	15	2.000	2.000	2.000	120.0
0.000						
15	15	16	1.500	2.000	0.000	120.0
0.000						
16	14	17	1.500	2.000	0.000	120.0
1.219						
17	17	18	1.500	2.000	0.000	120.0
0.000						
18	18	19	1.500	2.000	0.000	120.0
0.000						
19	19	20	1.500	2.000	0.000	120.0
0.000						
20	20	21	1.500	2.000	0.000	120.0
0.000						
21	21	22	1.500	2.000	0.000	120.0
0.000						
22	22	23	1.500	2.000	0.000	120.0
0.000						
23	14	24	1.500	2.000	0.000	120.0
1.219						
24	24	25	1.500	2.000	0.000	120.0
0.000						
25	25	26	1.500	2.000	0.000	120.0
0.000						
26	26	27	1.500	2.000	0.000	120.0
0.000						
27	27	28	1.500	2.000	0.000	120.0
0.000						
28	28	29	1.500	2.000	0.000	120.0
0.000						
29	29	30	1.500	2.000	0.000	120.0
0.000						
30	14	31	3.000	2.000	2.000	120.0
4.572						
31	31	32	1.500	2.000	0.000	120.0
0.000						
32	32	33	1.500	2.000	0.000	120.0
0.000						
33	33	34	1.500	2.000	0.000	120.0
0.000						
34	34	35	1.500	2.000	0.000	120.0
0.000						
35	35	36	1.500	2.000	0.000	120.0
0.000						
36	36	37	1.500	2.000	0.000	120.0
0.000						
37	37	38	1.500	2.000	0.000	120.0
0.000						
38	31	39	1.500	2.000	0.000	120.0
0.000						
39	39	40	1.500	2.000	0.000	120.0
0.000						
40	40	41	1.500	2.000	0.000	120.0
0.000						
41	41	42	1.500	2.000	0.000	120.0
0.000						
42	42	43	1.500	2.000	0.000	120.0
0.000						
43	43	44	1.500	2.000	0.000	120.0
0.000						
44	44	45	1.500	2.000	0.000	120.0

0.000
1

PIPE CONFIGURATION

Pipe Label	Input Node	Output Node	Nom.Bore (inches)	Length (metres)	Elevation (metres)	C Factor	Fitt.eq.lnth (metres)
45	65	8	1.500	8.000	0.000	120.0	0.000
46	8	47	1.500	1.500	0.000	120.0	0.000
47	47	48	1.500	3.500	3.500	120.0	2.438
48	48	49	1.0000	0.5000	0.000	120.0	0.6096
49	49	50	1.0000	1.100	0.000	120.0	0.000
50	50	51	1.0000	1.100	0.000	120.0	0.000
51	51	52	1.0000	1.100	0.000	120.0	0.000
52	48	53	1.0000	0.5000	0.000	120.0	0.6096
53	53	54	1.0000	1.100	0.000	120.0	0.000
54	54	55	1.0000	1.100	0.000	120.0	0.000
55	55	56	1.0000	1.100	0.000	120.0	0.000
56	16	57	1.500	1.500	0.000	120.0	0.000
57	57	58	1.500	1.500	0.000	120.0	0.000
58	15	59	1.500	2.000	0.000	120.0	0.000
59	59	60	1.500	1.500	0.000	120.0	0.000
60	60	61	1.500	1.500	0.000	120.0	0.000
61	62	63	2.000	1.900	0.000	120.0	0.000
62	2	62	2.000	7.000	0.000	120.0	0.000
63	2	11	3.000	2.500	0.000	120.0	0.000

PIPE FITTINGS

Pipe Label	Number x Type	Equivalent Length (metres)
1	1 x 4	6.096
13	1 x 4	4.572
16	1 x 2	1.219

23	1 x	2	1.219
30	1 x	4	4.572
47	1 x	4	2.438
48	1 x	2	0.6096
52	1 x	2	0.6096

Fitting types are :
1 -- 45 Deg Elbow
2 -- 90 Deg Standard Elbow
3 -- 90 Deg Long Radius Elbow
4 -- Tee or Cross (Flow Turned Thro 90 Deg)
5 -- Gate Valve
6 -- Swing Check Valve
1

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7 -- Non-Return Valve
8 -- Ball Valve
9 -- Butterfly Valve
1

NOZZLE CONFIGURATION

Nozzle Label	Input Node	Nozzle Type	K-Factor	Req Flow (lit/min)	Min Press (bar G)	Max Press (bar G)
1	6	4	51.0000	90.0000	0.25000E+01	0.50000E+01
2	7	4	51.0000	90.0000	0.25000E+01	0.50000E+01
3	18	2	35.0000	60.0000	0.25000E+01	0.50000E+01
4	19	2	35.0000	60.0000	0.25000E+01	0.50000E+01
5	10	4	51.0000	90.0000	0.25000E+01	0.50000E+01
6	12	4	51.0000	90.0000	0.25000E+01	0.50000E+01
7	57	4	51.0000	90.0000	0.25000E+01	0.50000E+01
8	58	4	51.0000	90.0000	0.25000E+01	0.50000E+01
9	20	2	35.0000	60.0000	0.25000E+01	0.50000E+01
10	21	2	35.0000	60.0000	0.25000E+01	0.50000E+01
11	60	4	51.0000	90.0000	0.25000E+01	0.50000E+01
12	61	4	51.0000	90.0000	0.25000E+01	0.50000E+01
13	22	2	35.0000	60.0000	0.25000E+01	0.50000E+01
14	23	2	35.0000	60.0000	0.25000E+01	0.50000E+01

15	25	2	35.0000	60.0000	0.25000E+01
0.50000E+01					
16	26	2	35.0000	60.0000	0.25000E+01
0.50000E+01					
17	27	2	35.0000	60.0000	0.25000E+01
0.50000E+01					
18	28	2	35.0000	60.0000	0.25000E+01
0.50000E+01					
19	29	2	35.0000	60.0000	0.25000E+01
0.50000E+01					
20	30	2	35.0000	60.0000	0.25000E+01
0.50000E+01					
21	40	2	35.0000	60.0000	0.25000E+01
0.50000E+01					
22	41	2	35.0000	60.0000	0.25000E+01
0.50000E+01					
23	42	2	35.0000	60.0000	0.25000E+01
0.50000E+01					
24	43	2	35.0000	60.0000	0.25000E+01
0.50000E+01					
25	44	2	35.0000	60.0000	0.25000E+01
0.50000E+01					
26	45	2	35.0000	60.0000	0.25000E+01
0.50000E+01					
27	33	2	35.0000	60.0000	0.25000E+01
0.50000E+01					
28	34	2	35.0000	60.0000	0.25000E+01
0.50000E+01					
29	35	2	35.0000	60.0000	0.25000E+01
0.50000E+01					
30	36	2	35.0000	60.0000	0.25000E+01
0.50000E+01					
31	37	2	35.0000	60.0000	0.25000E+01
0.50000E+01					
32	38	2	35.0000	60.0000	0.25000E+01
0.50000E+01					
33	50	3	18.0000	30.0000	0.25000E+01
0.50000E+01					
34	51	3	18.0000	30.0000	0.25000E+01
0.50000E+01					
35	52	3	18.0000	30.0000	0.25000E+01
0.50000E+01					
36	54	3	18.0000	30.0000	0.25000E+01
0.50000E+01					
37	55	3	18.0000	30.0000	0.25000E+01
0.50000E+01					
38	56	3	18.0000	30.0000	0.25000E+01
0.50000E+01					

1

Nozzle types are :
2 -- Nozzles for H1
3 -- nozzles for h2
4 -- Nozzle for P

1

DESIGNED DIAMETERS & FLOWRATES

Pipe Label	Input Node	Output Node	Flowrate (lit/min)	Pipe Type	Act. Bore (inches)	Nom. Size (inches)	Pipe Group
1	1	2	2407.5625	3	4.0260	4.0000	*
3	3	4	369.2936	3	2.0670	2.0000	*
4	4	5	184.6468	3	1.6100	1.5000	*
5	5	6	184.6468	3	1.6100	1.5000	*
6	6	7	92.2677	3	1.6100	1.5000	*
7	63	3	734.7587	3	2.0670	2.0000	*
8	4	9	184.6468	3	1.6100	1.5000	*
9	9	10	184.6468	3	1.6100	1.5000	*
10	2	65	196.8742	3	1.6100	1.5000	*
11	10	12	92.2677	3	1.6100	1.5000	*
12	3	13	365.4651	3	2.0670	2.0000	*
13	11	14	1475.9302	3	3.0680	3.0000	*
14	13	15	365.4651	3	2.0670	2.0000	*
15	15	16	182.7325	3	1.6100	1.5000	*
16	14	17	373.7258	3	1.6100	1.5000	*
17	17	18	373.7258	3	1.6100	1.5000	*
18	18	19	309.9557	3	1.6100	1.5000	*
19	19	20	247.1455	3	1.6100	1.5000	*
20	20	21	184.9745	3	1.6100	1.5000	*
21	21	22	123.1808	3	1.6100	1.5000	*
22	22	23	61.5656	3	1.6100	1.5000	*
23	14	24	373.7258	3	1.6100	1.5000	*
24	24	25	373.7258	3	1.6100	1.5000	*
25	25	26	309.9557	3	1.6100	1.5000	*
26	26	27	247.1455	3	1.6100	1.5000	*
27	27	28	184.9745	3	1.6100	1.5000	*
28	28	29	123.1808	3	1.6100	1.5000	*
29	29	30	61.5656	3	1.6100	1.5000	*
30	14	31	728.4784	3	3.0680	3.0000	*
31	31	32	364.2392	3	1.6100	1.5000	*
32	32	33	364.2392	3	1.6100	1.5000	*
33	33	34	302.0823	3	1.6100	1.5000	*
34	34	35	240.8645	3	1.6100	1.5000	*
35	35	36	180.2721	3	1.6100	1.5000	*
36	36	37	120.0488	3	1.6100	1.5000	*
37	37	38	60.0001	3	1.6100	1.5000	*
38	31	39	364.2392	3	1.6100	1.5000	*
39	39	40	364.2392	3	1.6100	1.5000	*
40	40	41	302.0823	3	1.6100	1.5000	*

1

TITLE : DATE : 6-Sep-2022

DESIGNED DIAMETERS & FLOWRATES

Pipe Label	Input Node	Output Node	Flowrate (lit/min)	Pipe Type	Act. Bore (inches)	Nom. Size (inches)	Pipe Group
41	41	42	240.8645	3	1.6100	1.5000	*
42	42	43	180.2721	3	1.6100	1.5000	*
43	43	44	120.0488	3	1.6100	1.5000	*
44	44	45	60.0001	3	1.6100	1.5000	*
45	65	8	196.8742	3	1.6100	1.5000	*
46	8	47	196.8742	3	1.6100	1.5000	*
47	47	48	196.8742	3	1.6100	1.5000	*

48	48	49	98.4371	3	1.0490	1.0000	*
49	49	50	98.4371	3	1.0490	1.0000	*
50	50	51	65.5319	3	1.0490	1.0000	*
51	51	52	32.7490	3	1.0490	1.0000	*
52	48	53	98.4371	3	1.0490	1.0000	*
53	53	54	98.4371	3	1.0490	1.0000	*
54	54	55	65.5319	3	1.0490	1.0000	*
55	55	56	32.7490	3	1.0490	1.0000	*
56	16	57	182.7325	3	1.6100	1.5000	*
57	57	58	91.3111	3	1.6100	1.5000	*
58	15	59	182.7325	3	1.6100	1.5000	*
59	59	60	182.7325	3	1.6100	1.5000	*
60	60	61	91.3111	3	1.6100	1.5000	*
61	62	63	734.7587	3	2.0670	2.0000	*
62	2	62	734.7587	3	2.0670	2.0000	*
63	2	11	1475.9302	3	3.0680	3.0000	*

A * indicates that this is a SET diameter

Pipe Materials are :

Pipe Type	Lining Type	Thickness(inches)
3 -- ANSI B36.10 Sch.40	Not Lined	

1

FLOW IN PIPES

Pipe Label	Input Node	Output Node	Nom.Bore (inches)	Inlet Pr. (bar G)	Outlet Pr. (bar G)	Drop in Pr. (bar)	Frict. Loss (bar)	Flowrate (lit/min)	Velocity (m/sec)
1	1	2	4.00	5.028	4.367	0.6614	0.6614	2408.	4.886
3	3	4	2.00	3.584	3.348	0.2364	4.0613E-02	369.3	2.843
4	4	5	1.50	3.348	3.310	3.8040E-02	3.8040E-02	184.6	2.343
5	5	6	1.50	3.310	3.281	2.8530E-02	2.8530E-02	184.6	2.343
6	6	7	1.50	3.281	3.273	7.9048E-03	7.9048E-03	92.27	1.171
7	63	3	2.00	3.722	3.584	0.1378	0.1378	734.8	5.657
8	4	9	1.50	3.348	3.310	3.8040E-02	3.8040E-02	184.6	2.343
9	9	10	1.50	3.310	3.281	2.8530E-02	2.8530E-02	184.6	2.343
10	2	65	1.50	4.367	4.121	0.2463	0.2463	196.9	2.498
11	10	12	1.50	3.281	3.273	7.9048E-03	7.9048E-03	92.27	1.171
12	3	13	2.00	3.584	3.514	6.9715E-02	6.9715E-02	365.5	2.814
13	11	14	3.00	4.271	3.686	0.5852	0.2916	1476.	5.158
14	13	15	2.00	3.514	3.279	0.2356	3.9838E-02	365.5	2.814
15	15	16	1.50	3.279	3.241	3.7315E-02	3.7315E-02	182.7	2.319

16	14	17	1.50	3.686	3.460	0.2257	0.2257
373.7	4.742						
17	17	18	1.50	3.460	3.320	0.1402	0.1402
373.7	4.742						
18	18	19	1.50	3.320	3.220	9.9180E-02	9.9180E-02
310.0	3.933						
19	19	20	1.50	3.220	3.155	6.5230E-02	6.5230E-02
247.1	3.136						
20	20	21	1.50	3.155	3.117	3.8165E-02	3.8165E-02
185.0	2.347						
21	21	22	1.50	3.117	3.099	1.7990E-02	1.7990E-02
123.2	1.563						
22	22	23	1.50	3.099	3.094	4.9899E-03	4.9899E-03
61.57	0.7812						
23	14	24	1.50	3.686	3.460	0.2257	0.2257
373.7	4.742						
24	24	25	1.50	3.460	3.320	0.1402	0.1402
373.7	4.742						
25	25	26	1.50	3.320	3.220	9.9180E-02	9.9180E-02
310.0	3.933						
26	26	27	1.50	3.220	3.155	6.5230E-02	6.5230E-02
247.1	3.136						
27	27	28	1.50	3.155	3.117	3.8165E-02	3.8165E-02
185.0	2.347						
28	28	29	1.50	3.117	3.099	1.7990E-02	1.7990E-02
123.2	1.563						
29	29	30	1.50	3.099	3.094	4.9899E-03	4.9899E-03
61.57	0.7812						
30	14	31	3.00	3.686	3.421	0.2643	6.8533E-02
728.5	2.546						
31	31	32	1.50	3.421	3.288	0.1337	0.1337
364.2	4.622						
32	32	33	1.50	3.288	3.154	0.1337	0.1337
364.2	4.622						
33	33	34	1.50	3.154	3.059	9.4565E-02	9.4565E-02
302.1	3.833						
34	34	35	1.50	3.059	2.997	6.2200E-02	6.2200E-02
240.9	3.056						
35	35	36	1.50	2.997	2.961	3.6390E-02	3.6390E-02
180.3	2.288						
36	36	37	1.50	2.961	2.944	1.7155E-02	1.7155E-02
120.0	1.523						
37	37	38	1.50	2.944	2.939	4.7550E-03	4.7550E-03
60.00	0.7614						
38	31	39	1.50	3.421	3.288	0.1337	0.1337
364.2	4.622						
39	39	40	1.50	3.288	3.154	0.1337	0.1337
364.2	4.622						
40	40	41	1.50	3.154	3.059	9.4565E-02	9.4565E-02
302.1	3.833						
41	41	42	1.50	3.059	2.997	6.2200E-02	6.2200E-02
240.9	3.056						
42	42	43	1.50	2.997	2.961	3.6390E-02	3.6390E-02
180.3	2.288						

1

FLOW IN PIPES

Pipe Label	Input Node	Output Node	Nom.Bore (inches)	Inlet Pr. (bar G)	Outlet Pr. (bar G)	Drop in Pr. (bar)	Frict. Loss (bar)	Flowrate (lit/min)	Velocity (m/sec)

43	43	44	1.50	2.961	2.944	1.7155E-02	1.7155E-02	120.0	1.523	
44	44	45	1.50	2.944	2.939	4.7550E-03	4.7550E-03	60.00	0.7614	
45	65	8	1.50	4.121	3.949	0.1713	0.1713	196.9	2.498	
46	8	47	1.50	3.949	3.917	3.2125E-02	3.2125E-02	196.9	2.498	
47	47	48	1.50	3.917	3.448	0.4698	0.1272	196.9	2.498	
48	48	49	1.00	3.448	3.394	5.3085E-02	5.3085E-02	98.44	2.942	
49	49	50	1.00	3.394	3.342	5.2630E-02	5.2630E-02	98.44	2.942	
50	50	51	1.00	3.342	3.317	2.4795E-02	2.4795E-02	65.53	1.959	
51	51	52	1.00	3.317	3.310	6.8700E-03	6.8700E-03	32.75	0.9789	
52	48	53	1.00	3.448	3.394	5.3085E-02	5.3085E-02	98.44	2.942	
53	53	54	1.00	3.394	3.342	5.2630E-02	5.2630E-02	98.44	2.942	
54	54	55	1.00	3.342	3.317	2.4795E-02	2.4795E-02	65.53	1.959	
55	55	56	1.00	3.317	3.310	6.8700E-03	6.8700E-03	32.75	0.9789	
56	16	57	1.50	3.241	3.213	2.7985E-02	2.7985E-02	182.7	2.319	
57	57	58	1.50	3.213	3.206	7.7550E-03	7.7550E-03	91.31	1.159	
58	15	59	1.50	3.279	3.241	3.7315E-02	3.7315E-02	182.7	2.319	
59	59	60	1.50	3.241	3.213	2.7985E-02	2.7985E-02	182.7	2.319	
60	60	61	1.50	3.213	3.206	7.7550E-03	7.7550E-03	91.31	1.159	
61	62	63	2.00	3.859	3.722	0.1378	0.1378	734.8	5.657	
62	2	62	2.00	4.367	3.859	0.5075	0.5075	734.8	5.657	
63	2	11	3.00	4.367	4.271	9.6265E-02	9.6265E-02	1476.	5.158	

FLOW THROUGH NOZZLES

Nozzle Label	Input Label	Inlet Press (bar G)	Req. Flow (lit/min)	Flowrate (lit/min)	% Deviation	Req. FlowDens (lit/min /metres **2)	FlowDens
1	6	0.32810E+01	90.0000	92.3789	2.64		
2	7	0.32731E+01	90.0000	92.2675	2.52		
3	18	0.33197E+01	60.0000	63.7699	6.28		
4	19	0.32205E+01	60.0000	62.8101	4.68		
5	10	0.32810E+01	90.0000	92.3789	2.64		
6	12	0.32731E+01	90.0000	92.2675	2.52		

7	57	0.32133E+01	90.0000	91.4212	1.58
8	58	0.32056E+01	90.0000	91.3109	1.46
9	20	0.31553E+01	60.0000	62.1708	3.62
10	21	0.31171E+01	60.0000	61.7936	2.99
11	60	0.32133E+01	90.0000	91.4212	1.58
12	61	0.32056E+01	90.0000	91.3109	1.46
13	22	0.30991E+01	60.0000	61.6150	2.69
14	23	0.30941E+01	60.0000	61.5655	2.61
15	25	0.33197E+01	60.0000	63.7699	6.28
16	26	0.32205E+01	60.0000	62.8101	4.68
17	27	0.31553E+01	60.0000	62.1708	3.62
18	28	0.31171E+01	60.0000	61.7936	2.99
19	29	0.30991E+01	60.0000	61.6150	2.69
20	30	0.30941E+01	60.0000	61.5655	2.61
21	40	0.31538E+01	60.0000	62.1567	3.59
22	41	0.30593E+01	60.0000	61.2177	2.03
23	42	0.29971E+01	60.0000	60.5922	0.99
24	43	0.29607E+01	60.0000	60.2232	0.37
25	44	0.29435E+01	60.0000	60.0485	0.08
26	45	0.29388E+01	60.0000	60.0000 *	0.00
27	33	0.31538E+01	60.0000	62.1567	3.59
28	34	0.30593E+01	60.0000	61.2177	2.03
29	35	0.29971E+01	60.0000	60.5922	0.99
30	36	0.29607E+01	60.0000	60.2232	0.37
31	37	0.29435E+01	60.0000	60.0485	0.08
32	38	0.29388E+01	60.0000	60.0000	0.00
33	50	0.33418E+01	30.0000	32.9051	9.68
34	51	0.33170E+01	30.0000	32.7828	9.28
35	52	0.33101E+01	30.0000	32.7489	9.16
36	54	0.33418E+01	30.0000	32.9051	9.68
37	55	0.33170E+01	30.0000	32.7828	9.28
38	56	0.33101E+01	30.0000	32.7489	9.16

Note: A * after a value indicates that this is a specification
1

FLOW AT INLETS

Inlet Node	Pressure (bar G)	Flowrate (lit/min)	Equivalent K-factor (lit/min , bar G)
1	5.028	2408.	1073.6

Note: A * after a value indicates that this is a specification
1

Materials Take-off

Pipe lengths

ANSI B36.10 Sch.40

Nom. Size (inches)	Tot. Length (metres)	Nom. Size (inches)	Tot. Length (metres)	Nom. Size (inches)	Tot. Length (metres)	Nom. Size (inches)	Tot. Length (metres)	Nom. Size (inches)	Tot. Length (metres)
1.000	7.600								
1.500	100.5								
2.000	18.30								
3.000	7.500								
4.000	20.00								

1

Materials Take-off

Nozzles

Type	K-Factor	Number
Nozzle for P	51.0000	8
Nozzles for H1	35.0000	24
nozzles for h2	18.0000	6

1

Materials Take Off

Fittings

Fitting Nominal Size (inches)	Fitting Type 1	2	3	4	5	6	7	8	9
1.000	0	2	0	0	0	0	0	0	0
1.500	0	2	0	1	0	0	0	0	0
3.000	0	0	0	2	0	0	0	0	0
4.000	0	0	0	1	0	0	0	0	0

Fitting Types are :

1 -- 45 Deg Elbow	4 -- Tee or Cross	7 -- Non-Return Valve
2 -- 90 Deg Standard Elbow	5 -- Gate Valve	8 -- Ball Valve
3 -- 90 Deg Long Radius Elbow	6 -- Swing Check Valve	9 -- Butterfly Valve

All fittings are as specified by user - no additional fittings have been generated automatically.

The supply demand graph is not available for the network without pump

1

IMPORTANT NOTICE

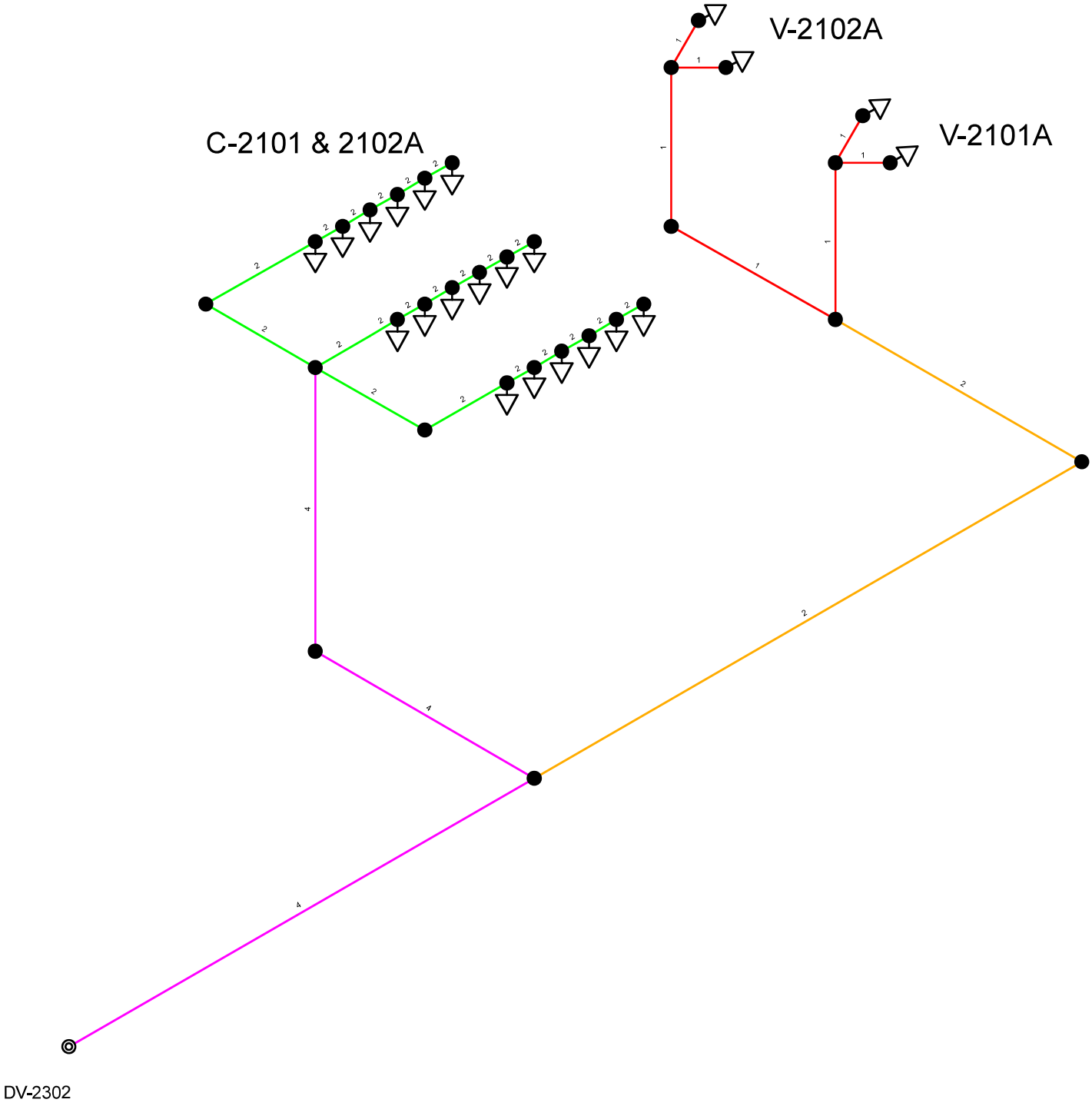
Your attention is drawn to the need to maintain adequate standards. SUNRISE SYSTEMS Ltd has itself taken steps to ensure that this program produces valid results when properly used. Users are reminded of their responsibilities in the application of program results and, in particular, you should ensure that pertinent output documents are examined and approved by qualified staff prior to use.

1

COMMENTS

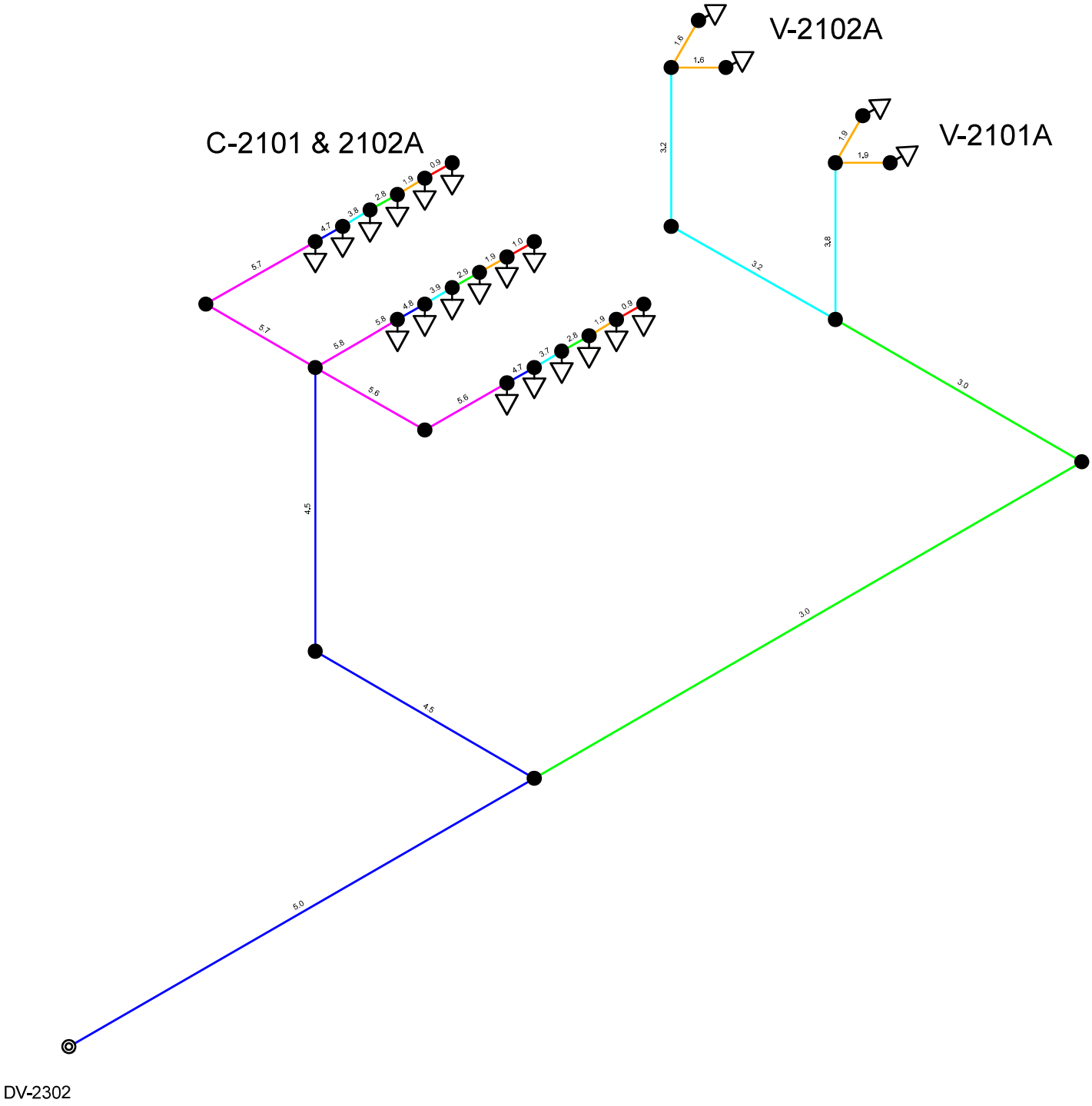
Analysis Converged in 3 Iterations
1

Att.2.2



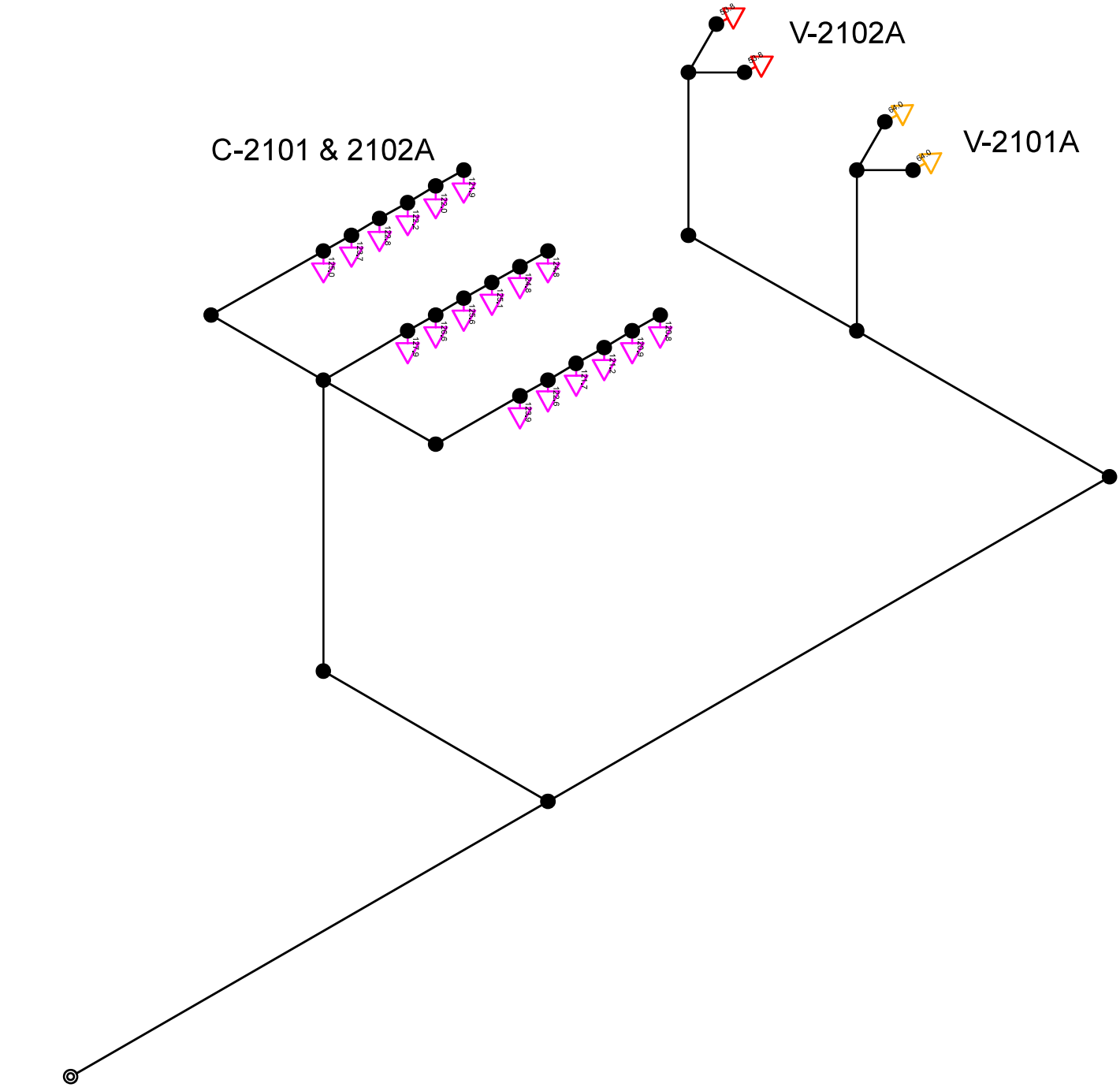
PIPENET Schematic	Saturday, May 14, 2022	Page 1 of 1

Pipe bore (in)	< 1.500000	< 2.000000	< 2.500000
	< 3.000000	< 3.500000	> 3.500000



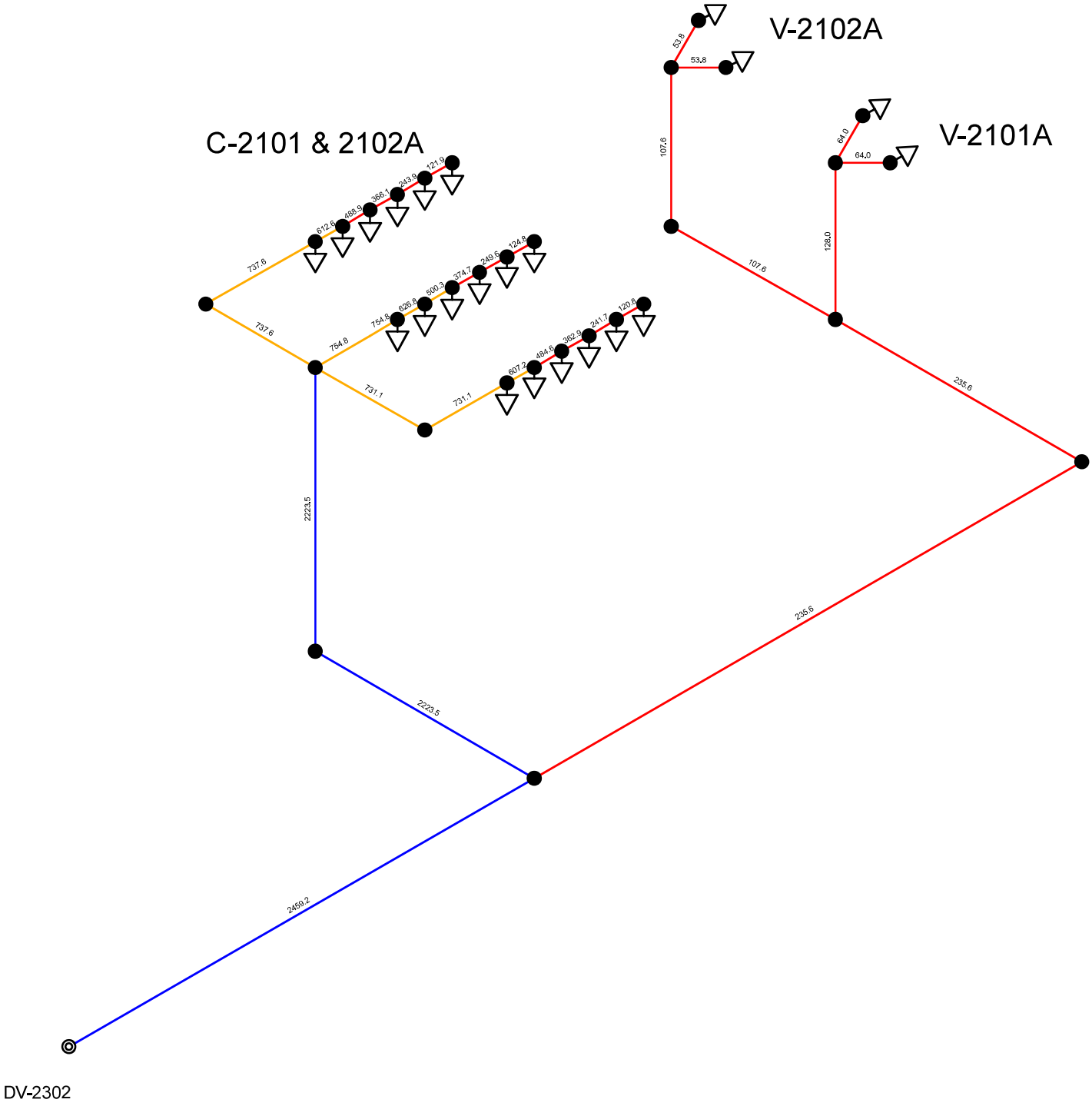
PIPENET Schematic	Saturday, May 14, 2022	Page 1 of 1

Pipe velocity (m/sec)	< 1.000000	< 2.000000	< 3.000000
	< 4.000000	< 5.000000	> 5.000000



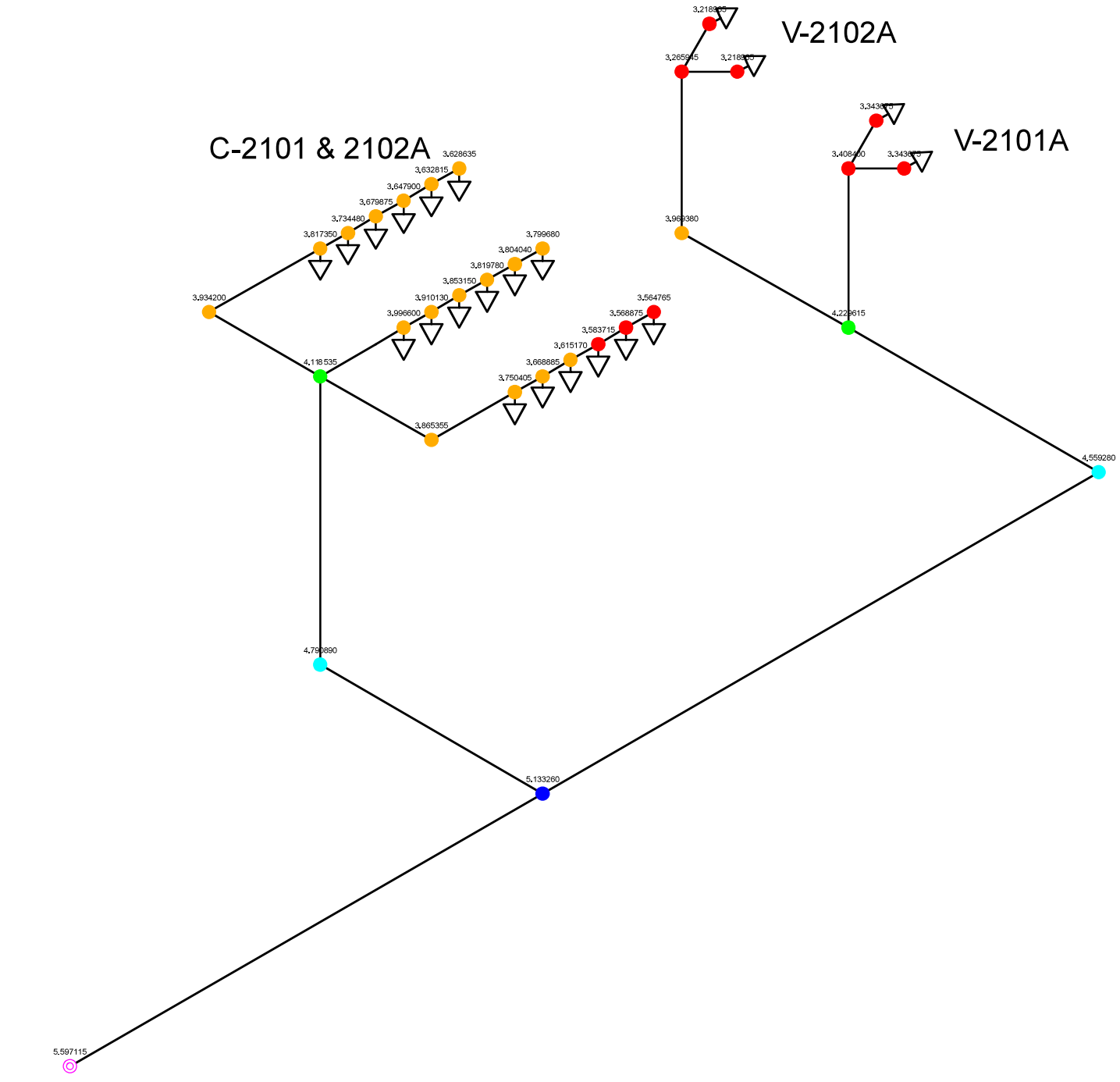
PIPENET Schematic	Saturday, May 14, 2022	Page 1 of 1

Nozzle calc. flow (l/min)	< 60.000000	< 75.000000	< 90.000000
	< 105.000000	< 120.000000	> 120.000000



PIPENET Schematic	Saturday, May 14, 2022	Page 1 of 1

Pipe vol. flow (l/min)	< 500.000000	< 1000.000000	< 1500.000000
	< 2000.000000	< 2500.000000	> 2500.000000



PIPENET Schematic	Saturday, May 14, 2022		Page 1 of 1
Pressure (Bar G)	< 3.600000	< 4.000000	< 4.400000
	< 4.800000	< 5.200000	> 5.200000

==========

PIPENET SPRAY/SPRINKLER MODULE

==========

VERSION 1.8

==========

Results for :

Licence Owner from key:

Licence Type: UNKNOWN

Key number: Unavailable

MUS Date: Unavailable

==========

11:44 on 10-May-2022

LIST OF CONTENTS

1

CONTROL INFORMATION

```
   Convergence accuracy      = 1.00E-03
   Maximum no. of iterations =    50
   Elevation Check Tolerance =     0.50 metres
   Warnings Control Option   =     0
   ****** Diagnostic level   =     2
```

FLUID SYSTEM

```
   Fluid Class          =  1 (Liquid             )
   Density              =   998.2     kg/cu.m
   Viscosity            =  1.0000E-03 Pa.s
```

1

DESIGN INFORMATION

Waterspray System

Pipe Materials are :

Pipe Type	Lining Type	Thickness(inches)
3 -- ANSI B36.10 Sch.40	Not Lined	

Design to NFPA 2013 Rules
Using the Hazen-Williams Equation

Velocity Pressure Model: Ignore velocity pressure

Pressure loss at entrance: Ignore

Pressure loss at exit: Ignore

1

AVAILABLE PIPE SIZES AND MAXIMUM VELOCITIES USED FOR PIPE SIZING

ANSI B36.10 Sch.40
Not lined

Nom.Bore (inches)	Act.Diam (inches)	Max.Vel. (m/sec)	Nom.Bore (inches)	Act.Diam (inches)	Max.Vel. (m/sec)	Nom.Bore (inches)	Act.Diam (inches)	Max.Vel. (m/sec)
0.6250	0.6220	4.0000						
0.7500	0.8240	4.0000						
1.0000	1.0490	4.0000						
1.2500	1.3800	4.0000						
1.5000	1.6100	4.0000						
2.0000	2.0670	4.0000						
2.5000	2.4690	4.0000						
3.0000	3.0680	4.0000						
3.5000	3.5480	4.0000						
4.0000	4.0260	4.0000						
5.0000	5.0470	4.0000						
6.0000	6.0650	4.0000						
8.0000	7.9810	4.0000						
10.0000	10.0200	4.0000						
12.0000	11.9380	4.0000						
14.0000	13.1240	4.0000						
16.0000	15.0000	4.0000						
18.0000	16.8760	4.0000						
20.0000	18.8120	4.0000						
24.0000	22.6240	4.0000						

PIPE CONFIGURATION

Pipe Label	Input Node	Output Node	Nom.Bore (inches)	Length (metres)	Elevation (metres)	C Factor	Fitt.eq.lnth (metres)
1	1	2	4.000	11.50	0.000	120.0	6.096
2	2	3	4.000	12.60	0.000	120.0	3.048
3	3	4	4.000	4.500	4.500	120.0	6.096
4	4	5	2.000	2.000	0.000	120.0	1.524
5	5	6	2.000	1.600	0.000	120.0	0.000
6	6	7	2.000	1.600	0.000	120.0	0.000
7	7	8	2.000	1.600	0.000	120.0	0.000

8	8	9	2.000	1.600	0.000	120.0
0.000						
9	9	10	2.000	1.600	0.000	120.0
0.000						
10	10	11	2.000	1.600	0.000	120.0
0.000						
12	4	13	2.000	1.600	0.000	120.0
0.000						
13	13	14	2.000	1.600	0.000	120.0
0.000						
14	14	15	2.000	1.600	0.000	120.0
0.000						
15	15	16	2.000	1.600	0.000	120.0
0.000						
16	16	17	2.000	1.600	0.000	120.0
0.000						
17	17	18	2.000	1.600	0.000	120.0
0.000						
18	4	19	2.000	1.0000	0.000	120.0
1.524						
19	19	20	2.000	1.600	0.000	120.0
0.000						
20	20	21	2.000	1.600	0.000	120.0
0.000						
21	21	22	2.000	1.600	0.000	120.0
0.000						
22	22	23	2.000	1.600	0.000	120.0
0.000						
23	23	24	2.000	1.600	0.000	120.0
0.000						
24	24	25	2.000	1.600	0.000	120.0
0.000						
25	2	26	1.500	18.00	0.000	120.0
1.219						
26	26	27	1.500	8.600	0.000	120.0
2.438						
27	27	28	1.0000	4.000	4.000	120.0
1.524						
28	27	29	1.0000	4.000	0.000	120.0
0.6096						
29	29	30	1.0000	4.000	4.000	120.0
1.524						
30	28	31	1.0000	3.000	0.000	120.0
0.000						
31	28	32	1.0000	3.000	0.000	120.0
0.000						
32	30	33	1.0000	3.000	0.000	120.0
0.000						
33	30	34	1.0000	3.000	0.000	120.0
0.000						

PIPE FITTINGS

Pipe Label	Number x Type	Equivalent Length (metres)
1	1 x 4	6.096
2	1 x 2	3.048
3	1 x 4	6.096
1		

PIPE FITTINGS

Pipe Label	Number x Type	Equivalent Length (metres)
4	1 x 2	1.524
18	1 x 2	1.524
25	1 x 2	1.219
26	1 x 4	2.438
27	1 x 4	1.524
28	1 x 2	0.6096
29	1 x 4	1.524

Fitting types are :
1 -- 45 Deg Elbow
2 -- 90 Deg Standard Elbow
3 -- 90 Deg Long Radius Elbow
4 -- Tee or Cross (Flow Turned Thro 90 Deg)
5 -- Gate Valve
6 -- Swing Check Valve
7 -- Non-Return Valve
8 -- Ball Valve
9 -- Butterfly Valve
1

NOZZLE CONFIGURATION

Nozzle Label	Input Node	Nozzle Type	K-Factor	Req Flow (lit/min)	Min Press (bar G)	Max Press (bar G)
1	11	1	64.0000	118.0000	0.25000E+01	0.40000E+01
2	10	1	64.0000	118.0000	0.25000E+01	0.40000E+01
3	9	1	64.0000	118.0000	0.25000E+01	0.40000E+01
4	8	1	64.0000	118.0000	0.25000E+01	0.40000E+01
5	7	1	64.0000	118.0000	0.25000E+01	0.40000E+01
6	6	1	64.0000	118.0000	0.25000E+01	0.40000E+01
7	18	1	64.0000	118.0000	0.25000E+01	0.40000E+01
8	17	1	64.0000	118.0000	0.25000E+01	0.40000E+01
9	16	1	64.0000	118.0000	0.25000E+01	0.40000E+01
10	15	1	64.0000	118.0000	0.25000E+01	0.40000E+01
11	14	1	64.0000	118.0000	0.25000E+01	0.40000E+01
12	13	1	64.0000	118.0000	0.25000E+01	0.40000E+01

13	20	1	64.0000	118.0000	0.25000E+01
0.40000E+01					
14	21	1	64.0000	118.0000	0.25000E+01
0.40000E+01					
15	22	1	64.0000	118.0000	0.25000E+01
0.40000E+01					
16	23	1	64.0000	118.0000	0.25000E+01
0.40000E+01					
17	24	1	64.0000	118.0000	0.25000E+01
0.40000E+01					
18	25	1	64.0000	118.0000	0.25000E+01
0.40000E+01					
19	31	3	35.0000	64.0000	0.25000E+01
0.40000E+01					
20	32	3	35.0000	64.0000	0.25000E+01
0.40000E+01					
21	33	2	30.0000	48.9000	0.25000E+01
0.40000E+01					
22	34	2	30.0000	48.9000	0.25000E+01
0.40000E+01					

Nozzle types are :
1 -- Nozzles for GC
2 -- Nozzles for vessels
3 -- Nozzle for vessels 1
1

DESIGNED DIAMETERS & FLOWRATES

Pipe Label	Input Node	Output Node	Flowrate (lit/min)	Pipe Type	Act. Bore (inches)	Nom. Size (inches)	Pipe Group
1	1	2	2459.1860	3	4.0260	4.0000	*
2	2	3	2223.5366	3	4.0260	4.0000	*
3	3	4	2223.5366	3	4.0260	4.0000	*
4	4	5	731.1163	3	2.0670	2.0000	*
5	5	6	731.1163	3	2.0670	2.0000	*
6	6	7	607.1738	3	2.0670	2.0000	*
7	7	8	484.5858	3	2.0670	2.0000	*
8	8	9	362.8984	3	2.0670	2.0000	*
9	9	10	241.7417	3	2.0670	2.0000	*
10	10	11	120.8360	3	2.0670	2.0000	*
12	4	13	754.7920	3	2.0670	2.0000	*
13	13	14	626.8461	3	2.0670	2.0000	*
14	14	15	500.2919	3	2.0670	2.0000	*
15	15	16	374.6631	3	2.0670	2.0000	*
16	16	17	249.5796	3	2.0670	2.0000	*
17	17	18	124.7540	3	2.0670	2.0000	*
18	4	19	737.6288	3	2.0670	2.0000	*
19	19	20	737.6288	3	2.0670	2.0000	*
20	20	21	612.5851	3	2.0670	2.0000	*
21	21	22	488.9060	3	2.0670	2.0000	*
22	22	23	366.1346	3	2.0670	2.0000	*
23	23	24	243.8976	3	2.0670	2.0000	*
24	24	25	121.9137	3	2.0670	2.0000	*
25	2	26	235.6494	3	1.6100	1.5000	*
26	26	27	235.6494	3	1.6100	1.5000	*
27	27	28	128.0003	3	1.0490	1.0000	*
28	27	29	107.6491	3	1.0490	1.0000	*

29	29	30	107.6491	3	1.0490	1.0000	*
30	28	31	64.0001	3	1.0490	1.0000	*
31	28	32	64.0001	3	1.0490	1.0000	*
32	30	33	53.8245	3	1.0490	1.0000	*
33	30	34	53.8245	3	1.0490	1.0000	*

A * indicates that this is a SET diameter

Pipe Materials are :

Pipe Type	Lining Type	Thickness(inches)
3 -- ANSI B36.10 Sch.40	Not Lined	

1

FLOW IN PIPES

Pipe Label	Input Node	Output Node	Nom.Bore (inches)	Inlet Pr. (bar G)	Outlet Pr. (bar G)	Drop in Pr. (bar)	Frict. Loss (bar)	Flowrate (lit/min)	Velocity (m/sec)
1	1	2	4.00	5.597	5.133	0.4639	0.4639	2459.	4.990
2	2	3	4.00	5.133	4.791	0.3424	0.3424	2224.	4.512
3	3	4	4.00	4.791	4.119	0.6724	0.2318	2224.	4.512
4	4	5	2.00	4.119	3.865	0.2532	0.2532	731.1	5.628
5	5	6	2.00	3.865	3.750	0.1149	0.1149	731.1	5.628
6	6	7	2.00	3.750	3.669	8.1520E-02	8.1520E-02	607.2	4.674
7	7	8	2.00	3.669	3.615	5.3715E-02	5.3715E-02	484.6	3.731
8	8	9	2.00	3.615	3.584	3.1455E-02	3.1455E-02	362.9	2.794
9	9	10	2.00	3.584	3.569	1.4840E-02	1.4840E-02	241.7	1.861
10	10	11	2.00	3.569	3.565	4.1101E-03	4.1101E-03	120.8	0.9303
12	4	13	2.00	4.119	3.997	0.1219	0.1219	754.8	5.811
13	13	14	2.00	3.997	3.910	8.6470E-02	8.6470E-02	626.8	4.826
14	14	15	2.00	3.910	3.853	5.6980E-02	5.6980E-02	500.3	3.851
15	15	16	2.00	3.853	3.820	3.3370E-02	3.3370E-02	374.7	2.884
16	16	17	2.00	3.820	3.804	1.5740E-02	1.5740E-02	249.6	1.921
17	17	18	2.00	3.804	3.800	4.3600E-03	4.3600E-03	124.8	0.9604
18	4	19	2.00	4.119	3.934	0.1843	0.1843	737.6	5.679
19	19	20	2.00	3.934	3.817	0.1169	0.1169	737.6	5.679
20	20	21	2.00	3.817	3.734	8.2870E-02	8.2870E-02	612.6	4.716
21	21	22	2.00	3.734	3.680	5.4605E-02	5.4605E-02		

```
488.9       3.764
    22           22          23          2.00   3.680       3.648      3.1975E-02  3.1975E-02
366.1       2.819
    23           23          24          2.00   3.648       3.633      1.5085E-02  1.5085E-02
243.9       1.878
    24           24          25          2.00   3.633       3.629      4.1800E-03  4.1800E-03
121.9      0.9386
    25            2          26          1.50   5.133       4.559      0.5740      0.5740
235.6       2.990
    26           26          27          1.50   4.559       4.230      0.3297      0.3297
235.6       2.990
    27           27          28          1.00   4.230       3.408      0.8212      0.4296
128.0       3.826
    28           27          29          1.00   4.230       3.969      0.2602      0.2602
107.6       3.218
    29           29          30          1.00   3.969       3.266      0.7034      0.3119
107.6       3.218
    30           28          31          1.00   3.408       3.344      6.4725E-02  6.4725E-02
64.00       1.913
    31           28          32          1.00   3.408       3.344      6.4725E-02  6.4725E-02
64.00       1.913
    32           30          33          1.00   3.266       3.219      4.6980E-02  4.6980E-02
53.82       1.609
    33           30          34          1.00   3.266       3.219      4.6980E-02  4.6980E-02
53.82       1.609
1
```

 FLOW THROUGH NOZZLES

Nozzle Label	Input Label	Inlet Press (bar G)	Req. Flow (lit/min)	Flowrate (lit/min)	% Deviation	Req. FlowDens (lit/min /metres **2)
1	11	0.35648E+01	118.0000	120.8357	2.40	
2	10	0.35689E+01	118.0000	120.9054	2.46	
3	9	0.35837E+01	118.0000	121.1565	2.67	
4	8	0.36152E+01	118.0000	121.6871	3.12	
5	7	0.36689E+01	118.0000	122.5877	3.89	
6	6	0.37504E+01	118.0000	123.9421	5.04	
7	18	0.37997E+01	118.0000	124.7537	5.72	
8	17	0.38040E+01	118.0000	124.8253	5.78	
9	16	0.38198E+01	118.0000	125.0833	6.00	
10	15	0.38531E+01	118.0000	125.6284	6.46	
11	14	0.39101E+01	118.0000	126.5539	7.25	
12	13	0.39966E+01	118.0000	127.9456	8.43	
13	20	0.38173E+01	118.0000	125.0434	5.97	
14	21	0.37345E+01	118.0000	123.6787	4.81	
15	22	0.36799E+01	118.0000	122.7712	4.04	
16	23	0.36479E+01	118.0000	122.2366	3.59	
17	24	0.36328E+01	118.0000	121.9837	3.38	
18	25	0.36286E+01	118.0000	121.9134	3.32	
19	31	0.33437E+01	64.0000	64.0000 *	0.00	
20	32	0.33437E+01	64.0000	64.0000	0.00	
21	33	0.32190E+01	48.9000	53.8244	10.07	
22	34	0.32190E+01	48.9000	53.8244	10.07	

 Note: A * after a value indicates that this is a specification
1

FLOW AT INLETS

Inlet Node	Pressure (bar G)	Flowrate (lit/min)	Equivalent K-factor (lit/min , bar G)
1	5.597	2459.	1039.5

Note: A * after a value indicates that this is a specification
1

Materials Take-off

Pipe lengths

ANSI B36.10 Sch.40

Nom. Size (inches)	Tot. Length (metres)	Nom. Size (inches)	Tot. Length (metres)	Nom. Size (inches)	Tot. Length (metres)	Nom. Size (inches)	Tot. Length (metres)	Nom. Size (inches)	Tot. Length (metres)
1.000	24.00								
1.500	26.60								
2.000	31.80								
4.000	28.60								

1

Materials Take-off

Nozzles

Type	K-Factor	Number
Nozzles for GC	64.0000	18
Nozzle for vessels 1	35.0000	2
Nozzles for vessels	30.0000	2

1

Materials Take Off

Fittings

Fitting Nominal Size (inches)	Fitting Type 1	2	3	4	5	6	7	8	9
1.000	0	1	0	2	0	0	0	0	0
1.500	0	1	0	1	0	0	0	0	0
2.000	0	2	0	0	0	0	0	0	0
4.000	0	1	0	2	0	0	0	0	0

Fitting Types are :

1 -- 45 Deg Elbow	4 -- Tee or Cross	7 -- Non-Return Valve
2 -- 90 Deg Standard Elbow	5 -- Gate Valve	8 -- Ball Valve
3 -- 90 Deg Long Radius Elbow	6 -- Swing Check Valve	9 -- Butterfly Valve

All fittings are as specified by user - no additional fittings have been generated automatically.

The supply demand graph is not available for the network without pump
1

IMPORTANT NOTICE

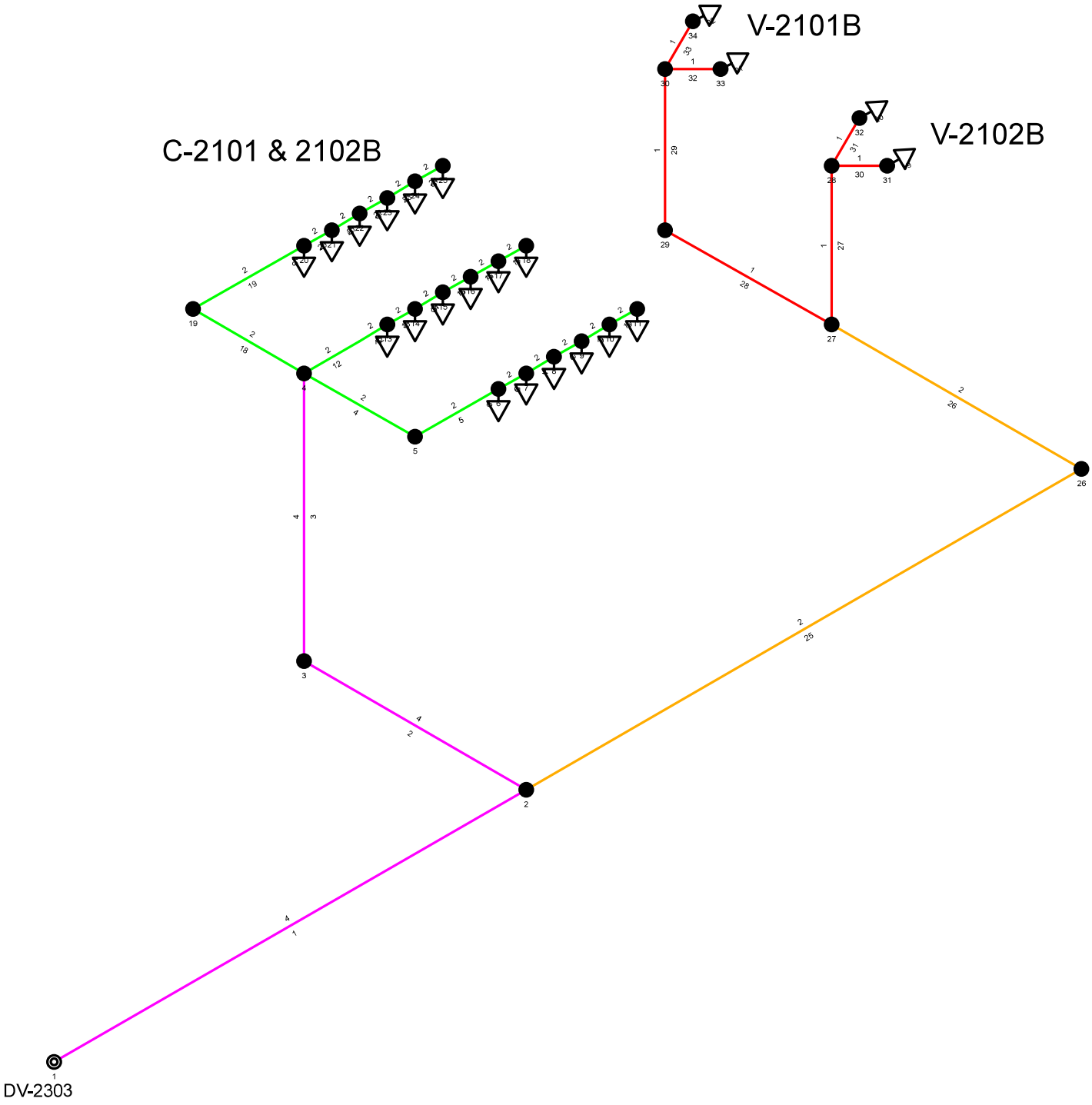
Your attention is drawn to the need to maintain adequate standards. SUNRISE SYSTEMS Ltd has itself taken steps to ensure that this program produces valid results when properly used. Users are reminded of their responsibilities in the application of program results and, in particular, you should ensure that pertinent output documents are examined and approved by qualified staff prior to use.

1

COMMENTS

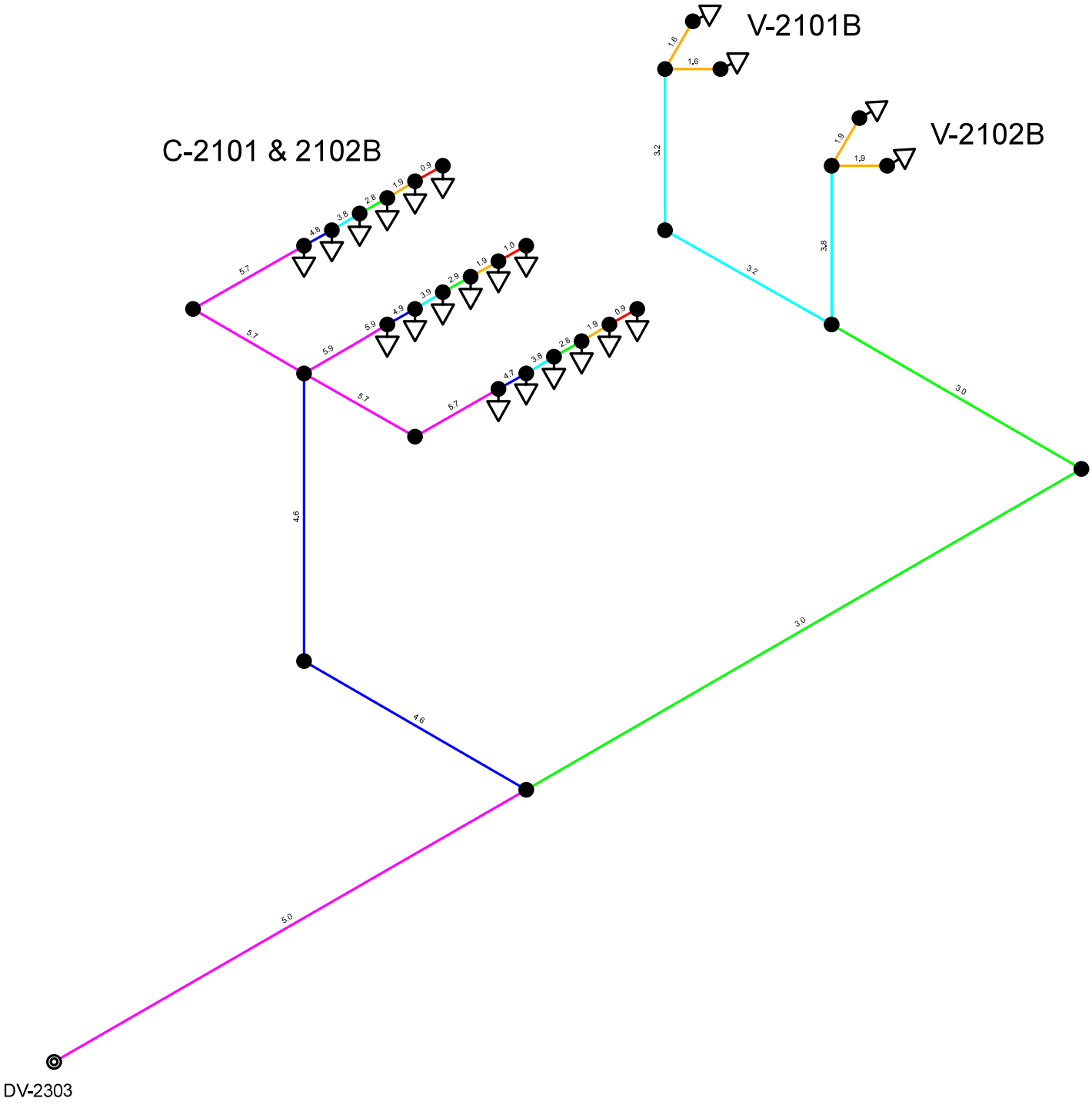
Analysis Converged in 3 Iterations
1

Att.2.3



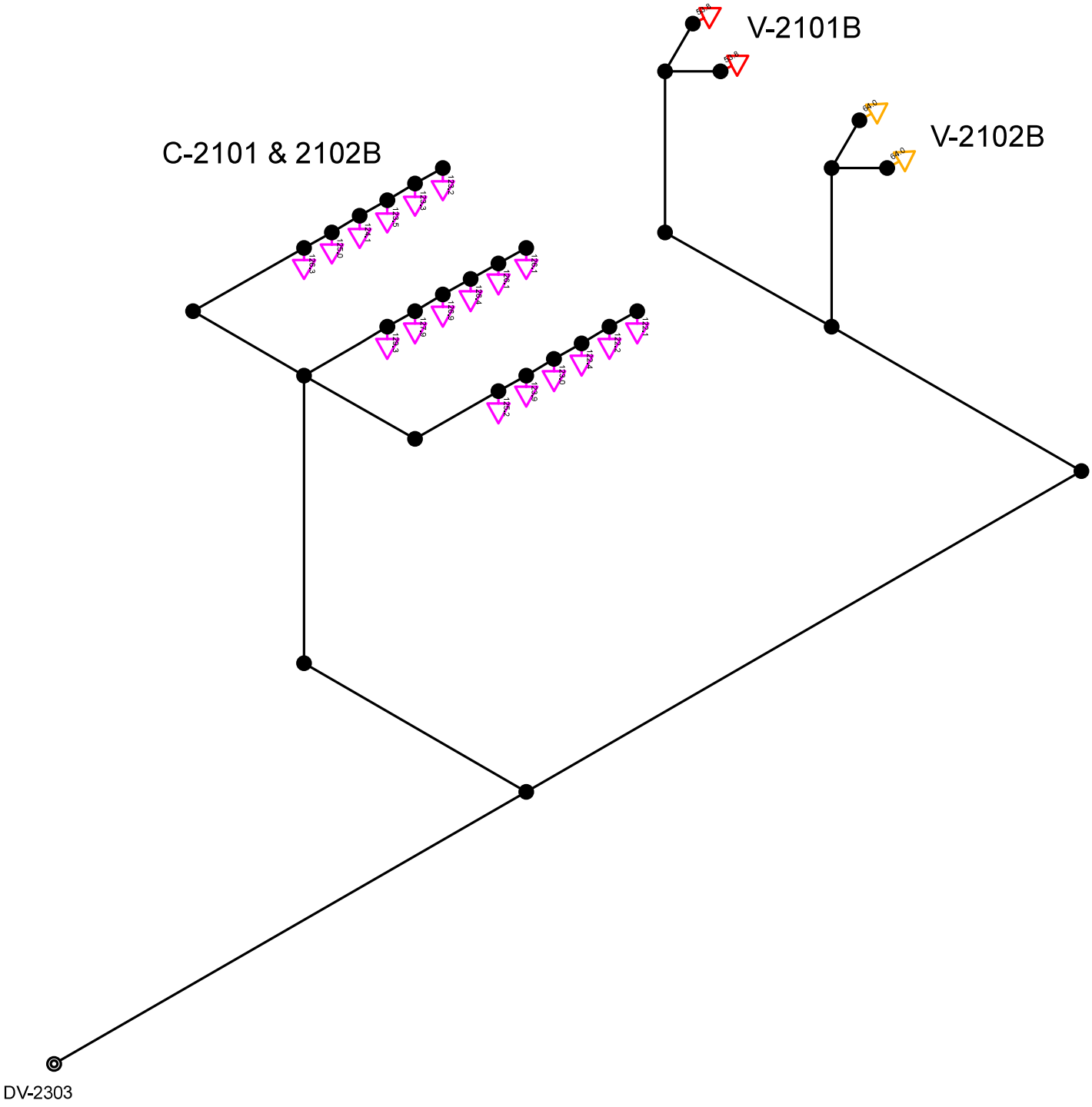
PIPENET Schematic	Saturday, May 14, 2022	Page 1 of 1

Pipe bore (in)	< 1.500000	< 2.000000	< 2.500000
	< 3.000000	< 3.500000	> 3.500000



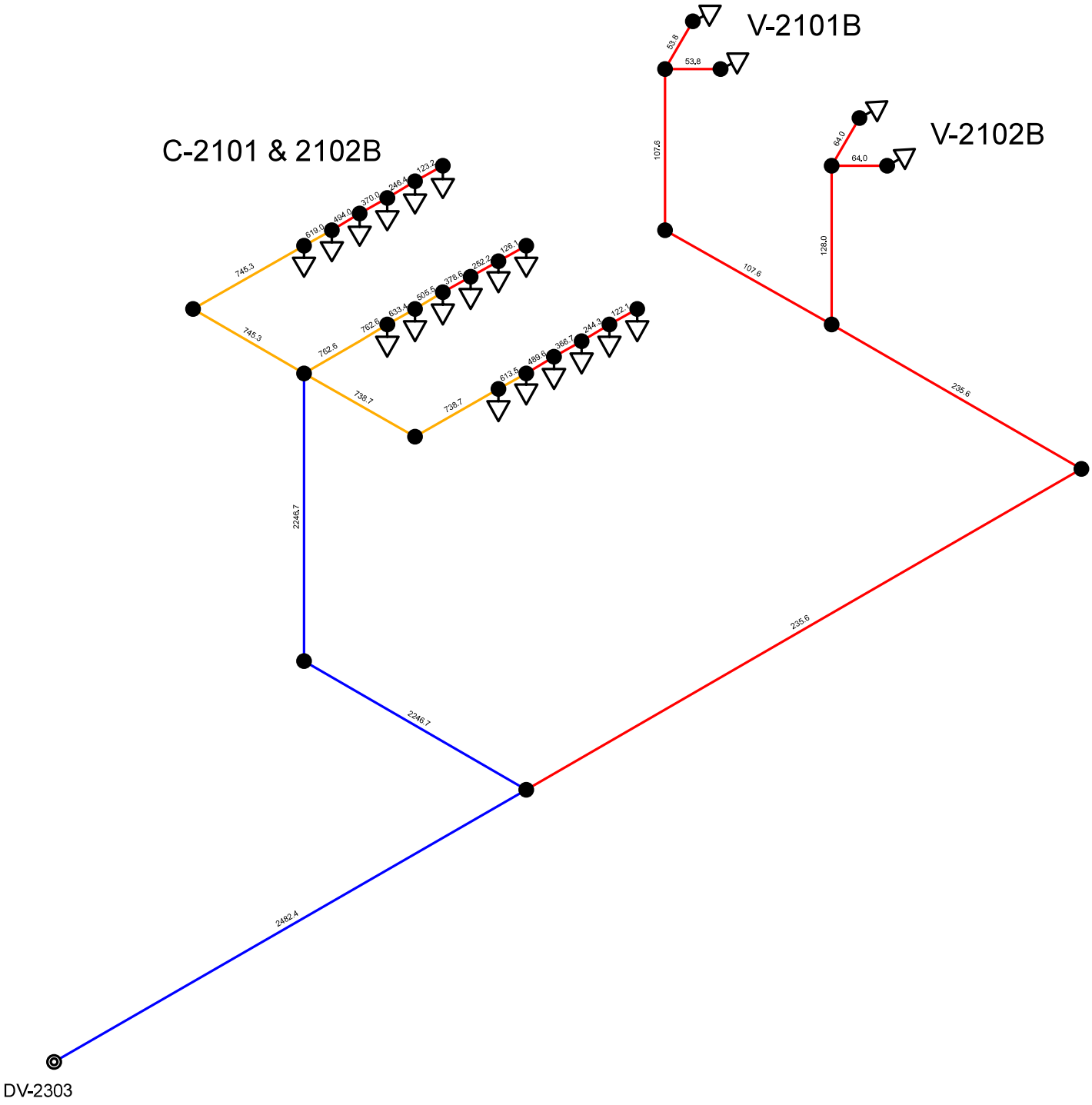
PIPENET Schematic	Saturday, May 14, 2022	Page 1 of 1

Pipe velocity (m/sec)	< 1.000000	< 2.000000	< 3.000000
	< 4.000000	< 5.000000	> 5.000000



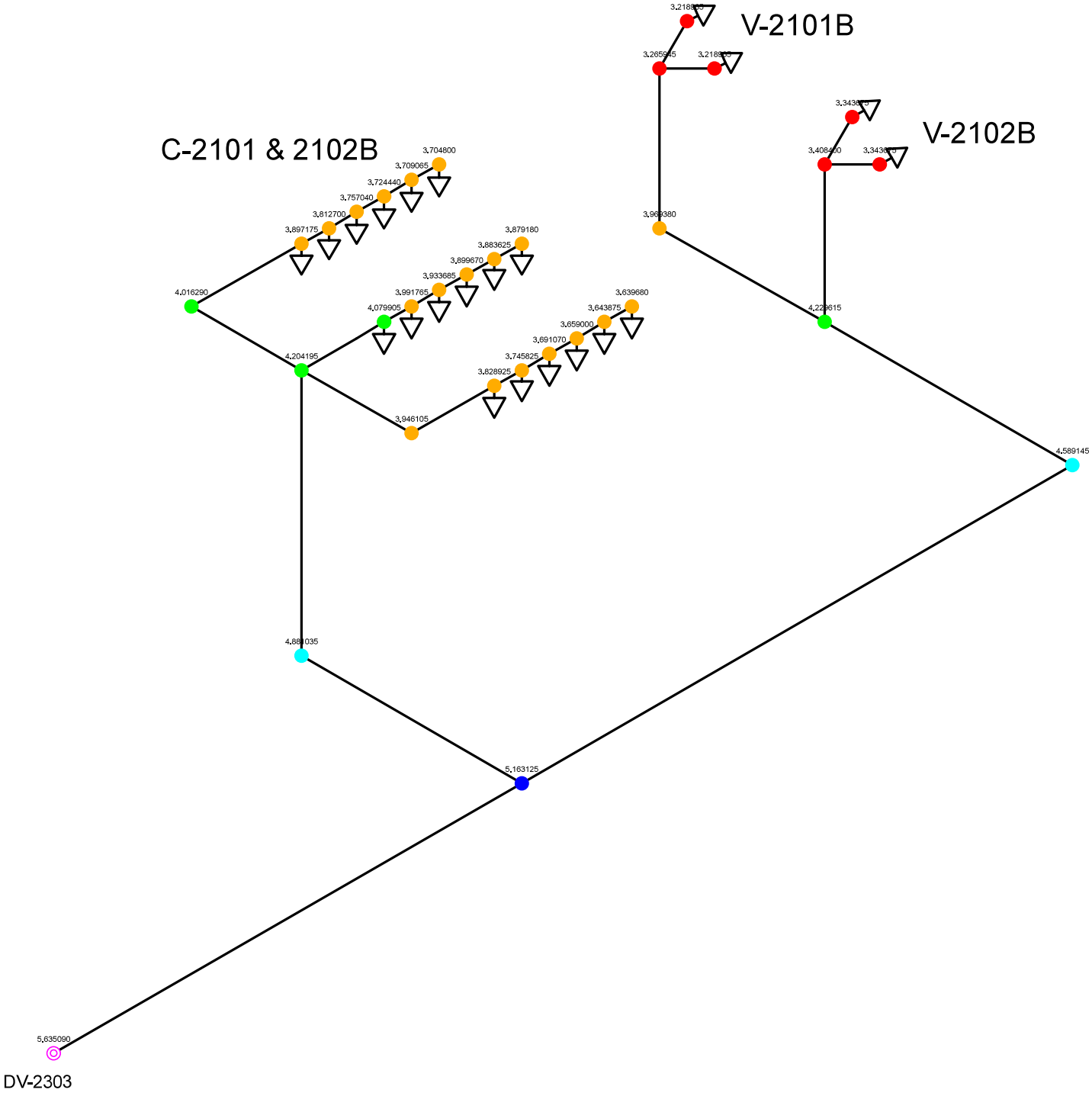
PIPENET Schematic	Saturday, May 14, 2022	Page 1 of 1

Nozzle calc. flow (l/min)	< 60.000000	< 75.000000	< 90.000000
	< 105.000000	< 120.000000	> 120.000000



PIPENET Schematic	Saturday, May 14, 2022	Page 1 of 1

Pipe vol. flow (l/min)	< 500.000000	< 1000.000000	< 1500.000000
	< 2000.000000	< 2500.000000	> 2500.000000



PIPENET Schematic	Saturday, May 14, 2022		Page 1 of 1
Pressure (Bar G)	< 3.500000	< 4.000000	< 4.500000
	< 5.000000	< 5.500000	> 5.500000

==========

PIPENET SPRAY/SPRINKLER MODULE

==========

VERSION 1.8

==========

Results for :

Licence Owner from key:

Licence Type: UNKNOWN

Key number: Unavailable

MUS Date: Unavailable

==========

12:22 on 10-May-2022

LIST OF CONTENTS

1

CONTROL INFORMATION

```
   Convergence accuracy      = 1.00E-03
   Maximum no. of iterations =    50
   Elevation Check Tolerance =     0.50 metres
   Warnings Control Option   =     0
   ****** Diagnostic level   =     2
```

FLUID SYSTEM

```
   Fluid Class          =  1 (Liquid             )
   Density              =   998.2     kg/cu.m
   Viscosity            =  1.0000E-03 Pa.s
```

1

DESIGN INFORMATION

Waterspray System

Pipe Materials are :

Pipe Type	Lining Type	Thickness(inches)
3 -- ANSI B36.10 Sch.40	Not Lined	

Design to NFPA 2013 Rules
Using the Hazen-Williams Equation

Velocity Pressure Model: Ignore velocity pressure

Pressure loss at entrance: Ignore

Pressure loss at exit: Ignore

1

AVAILABLE PIPE SIZES AND MAXIMUM VELOCITIES USED FOR PIPE SIZING

ANSI B36.10 Sch.40
Not lined

Nom.Bore (inches)	Act.Diam (inches)	Max.Vel. (m/sec)	Nom.Bore (inches)	Act.Diam (inches)	Max.Vel. (m/sec)	Nom.Bore (inches)	Act.Diam (inches)	Max.Vel. (m/sec)
0.6250	0.6220	4.0000						
0.7500	0.8240	4.0000						
1.0000	1.0490	4.0000						
1.2500	1.3800	4.0000						
1.5000	1.6100	4.0000						
2.0000	2.0670	4.0000						
2.5000	2.4690	4.0000						
3.0000	3.0680	4.0000						
3.5000	3.5480	4.0000						
4.0000	4.0260	4.0000						
5.0000	5.0470	4.0000						
6.0000	6.0650	4.0000						
8.0000	7.9810	4.0000						
10.0000	10.0200	4.0000						
12.0000	11.9380	4.0000						
14.0000	13.1240	4.0000						
16.0000	15.0000	4.0000						
18.0000	16.8760	4.0000						
20.0000	18.8120	4.0000						
24.0000	22.6240	4.0000						

PIPE CONFIGURATION

Pipe Label	Input Node	Output Node	Nom.Bore (inches)	Length (metres)	Elevation (metres)	C Factor	Fitt.eq.lnth (metres)
1	1	2	4.000	11.50	0.000	120.0	6.096
2	2	3	4.000	9.600	0.000	120.0	3.048
3	3	4	4.000	4.500	4.500	120.0	6.096
4	4	5	2.000	2.000	0.000	120.0	1.524
5	5	6	2.000	1.600	0.000	120.0	0.000
6	6	7	2.000	1.600	0.000	120.0	0.000
7	7	8	2.000	1.600	0.000	120.0	0.000

8	8	9	2.000	1.600	0.000	120.0
0.000						
9	9	10	2.000	1.600	0.000	120.0
0.000						
10	10	11	2.000	1.600	0.000	120.0
0.000						
12	4	13	2.000	1.600	0.000	120.0
0.000						
13	13	14	2.000	1.600	0.000	120.0
0.000						
14	14	15	2.000	1.600	0.000	120.0
0.000						
15	15	16	2.000	1.600	0.000	120.0
0.000						
16	16	17	2.000	1.600	0.000	120.0
0.000						
17	17	18	2.000	1.600	0.000	120.0
0.000						
18	4	19	2.000	1.0000	0.000	120.0
1.524						
19	19	20	2.000	1.600	0.000	120.0
0.000						
20	20	21	2.000	1.600	0.000	120.0
0.000						
21	21	22	2.000	1.600	0.000	120.0
0.000						
22	22	23	2.000	1.600	0.000	120.0
0.000						
23	23	24	2.000	1.600	0.000	120.0
0.000						
24	24	25	2.000	1.600	0.000	120.0
0.000						
25	2	26	1.500	18.00	0.000	120.0
1.219						
26	26	27	1.500	9.600	0.000	120.0
2.438						
27	27	28	1.0000	4.000	4.000	120.0
1.524						
28	27	29	1.0000	4.000	0.000	120.0
0.6096						
29	29	30	1.0000	4.000	4.000	120.0
1.524						
30	28	31	1.0000	3.000	0.000	120.0
0.000						
31	28	32	1.0000	3.000	0.000	120.0
0.000						
32	30	33	1.0000	3.000	0.000	120.0
0.000						
33	30	34	1.0000	3.000	0.000	120.0
0.000						

PIPE FITTINGS

Pipe Label	Number x Type	Equivalent Length (metres)
1	1 x 4	6.096
2	1 x 2	3.048
3	1 x 4	6.096

1

PIPE FITTINGS

Pipe Label	Number x Type	Equivalent Length (metres)
4	1 x 2	1.524
18	1 x 2	1.524
25	1 x 2	1.219
26	1 x 4	2.438
27	1 x 4	1.524
28	1 x 2	0.6096
29	1 x 4	1.524

Fitting types are :
1 -- 45 Deg Elbow
2 -- 90 Deg Standard Elbow
3 -- 90 Deg Long Radius Elbow
4 -- Tee or Cross (Flow Turned Thro 90 Deg)
5 -- Gate Valve
6 -- Swing Check Valve
7 -- Non-Return Valve
8 -- Ball Valve
9 -- Butterfly Valve
1

NOZZLE CONFIGURATION

Nozzle Label	Input Node	Nozzle Type	K-Factor	Req Flow (lit/min)	Min Press (bar G)	Max Press (bar G)
1	11	1	64.0000	118.0000	0.25000E+01	0.40000E+01
2	10	1	64.0000	118.0000	0.25000E+01	0.40000E+01
3	9	1	64.0000	118.0000	0.25000E+01	0.40000E+01
4	8	1	64.0000	118.0000	0.25000E+01	0.40000E+01
5	7	1	64.0000	118.0000	0.25000E+01	0.40000E+01
6	6	1	64.0000	118.0000	0.25000E+01	0.40000E+01
7	18	1	64.0000	118.0000	0.25000E+01	0.40000E+01
8	17	1	64.0000	118.0000	0.25000E+01	0.40000E+01
9	16	1	64.0000	118.0000	0.25000E+01	0.40000E+01
10	15	1	64.0000	118.0000	0.25000E+01	0.40000E+01
11	14	1	64.0000	118.0000	0.25000E+01	0.40000E+01
12	13	1	64.0000	118.0000	0.25000E+01	0.40000E+01

13	20	1	64.0000	118.0000	0.25000E+01 0.40000E+01
14	21	1	64.0000	118.0000	0.25000E+01 0.40000E+01
15	22	1	64.0000	118.0000	0.25000E+01 0.40000E+01
16	23	1	64.0000	118.0000	0.25000E+01 0.40000E+01
17	24	1	64.0000	118.0000	0.25000E+01 0.40000E+01
18	25	1	64.0000	118.0000	0.25000E+01 0.40000E+01
19	31	3	35.0000	64.0000	0.25000E+01 0.40000E+01
20	32	3	35.0000	64.0000	0.25000E+01 0.40000E+01
21	33	2	30.0000	48.9000	0.25000E+01 0.40000E+01
22	34	2	30.0000	48.9000	0.25000E+01 0.40000E+01

Nozzle types are :
1 -- Nozzles for GC
2 -- Nozzles for vessels
3 -- Nozzles for vessels 1
1

DESIGNED DIAMETERS & FLOWRATES

Pipe Label	Input Node	Output Node	Flowrate (lit/min)	Pipe Type	Act. Bore (inches)	Nom. Size (inches)	Pipe Group
1	1	2	2482.3562	3	4.0260	4.0000	*
2	2	3	2246.7070	3	4.0260	4.0000	*
3	3	4	2246.7070	3	4.0260	4.0000	*
4	4	5	738.7493	3	2.0670	2.0000	*
5	5	6	738.7493	3	2.0670	2.0000	*
6	6	7	613.5161	3	2.0670	2.0000	*
7	7	8	489.6494	3	2.0670	2.0000	*
8	8	9	366.6913	3	2.0670	2.0000	*
9	9	10	244.2686	3	2.0670	2.0000	*
10	10	11	122.0992	3	2.0670	2.0000	*
12	4	13	762.6375	3	2.0670	2.0000	*
13	13	14	633.3650	3	2.0670	2.0000	*
14	14	15	505.4966	3	2.0670	2.0000	*
15	15	16	378.5617	3	2.0670	2.0000	*
16	16	17	252.1769	3	2.0670	2.0000	*
17	17	18	126.0523	3	2.0670	2.0000	*
18	4	19	745.3206	3	2.0670	2.0000	*
19	19	20	745.3206	3	2.0670	2.0000	*
20	20	21	618.9761	3	2.0670	2.0000	*
21	21	22	494.0086	3	2.0670	2.0000	*
22	22	23	369.9567	3	2.0670	2.0000	*
23	23	24	246.4440	3	2.0670	2.0000	*
24	24	25	123.1866	3	2.0670	2.0000	*
25	2	26	235.6494	3	1.6100	1.5000	*
26	26	27	235.6494	3	1.6100	1.5000	*
27	27	28	128.0003	3	1.0490	1.0000	*
28	27	29	107.6491	3	1.0490	1.0000	*

29	29	30	107.6491	3	1.0490	1.0000	*
30	28	31	64.0001	3	1.0490	1.0000	*
31	28	32	64.0001	3	1.0490	1.0000	*
32	30	33	53.8245	3	1.0490	1.0000	*
33	30	34	53.8245	3	1.0490	1.0000	*

A * indicates that this is a SET diameter

Pipe Materials are :

Pipe Type	Lining Type	Thickness(inches)
3 -- ANSI B36.10 Sch.40	Not Lined	

1

FLOW IN PIPES

Pipe Label	Input Node	Output Node	Nom.Bore (inches)	Inlet Pr. (bar G)	Outlet Pr. (bar G)	Drop in Pr. (bar)	Frict. Loss (bar)	Flowrate (lit/min)	Velocity (m/sec)
1	1	2	4.00	5.635	5.163	0.4720	0.4720	2482.	5.037
2	2	3	4.00	5.163	4.881	0.2821	0.2821	2247.	4.559
3	3	4	4.00	4.881	4.204	0.6768	0.2363	2247.	4.559
4	4	5	2.00	4.204	3.946	0.2581	0.2581	738.7	5.687
5	5	6	2.00	3.946	3.829	0.1172	0.1172	738.7	5.687
6	6	7	2.00	3.829	3.746	8.3100E-02	8.3100E-02	613.5	4.723
7	7	8	2.00	3.746	3.691	5.4755E-02	5.4755E-02	489.6	3.770
8	8	9	2.00	3.691	3.659	3.2070E-02	3.2070E-02	366.7	2.823
9	9	10	2.00	3.659	3.644	1.5125E-02	1.5125E-02	244.3	1.881
10	10	11	2.00	3.644	3.640	4.1950E-03	4.1950E-03	122.1	0.9400
12	4	13	2.00	4.204	4.080	0.1243	0.1243	762.6	5.871
13	13	14	2.00	4.080	3.992	8.8140E-02	8.8140E-02	633.4	4.876
14	14	15	2.00	3.992	3.934	5.8080E-02	5.8080E-02	505.5	3.892
15	15	16	2.00	3.934	3.900	3.4015E-02	3.4015E-02	378.6	2.914
16	16	17	2.00	3.900	3.884	1.6045E-02	1.6045E-02	252.2	1.941
17	17	18	2.00	3.884	3.879	4.4451E-03	4.4451E-03	126.1	0.9704
18	4	19	2.00	4.204	4.016	0.1879	0.1879	745.3	5.738
19	19	20	2.00	4.016	3.897	0.1191	0.1191	745.3	5.738
20	20	21	2.00	3.897	3.813	8.4475E-02	8.4475E-02	619.0	4.765
21	21	22	2.00	3.813	3.757	5.5660E-02	5.5660E-02		

494.0 3.803
22 22 23 2.00 3.757 3.724 3.2600E-02 3.2600E-02
370.0 2.848
23 23 24 2.00 3.724 3.709 1.5375E-02 1.5375E-02
246.4 1.897
24 24 25 2.00 3.709 3.705 4.2651E-03 4.2651E-03
123.2 0.9484
25 2 26 1.50 5.163 4.589 0.5740 0.5740
235.6 2.990
26 26 27 1.50 4.589 4.230 0.3595 0.3595
235.6 2.990
27 27 28 1.00 4.230 3.408 0.8212 0.4296
128.0 3.826
28 27 29 1.00 4.230 3.969 0.2602 0.2602
107.6 3.218
29 29 30 1.00 3.969 3.266 0.7034 0.3119
107.6 3.218
30 28 31 1.00 3.408 3.344 6.4725E-02 6.4725E-02
64.00 1.913
31 28 32 1.00 3.408 3.344 6.4725E-02 6.4725E-02
64.00 1.913
32 30 33 1.00 3.266 3.219 4.6980E-02 4.6980E-02
53.82 1.609
33 30 34 1.00 3.266 3.219 4.6980E-02 4.6980E-02
53.82 1.609
1

FLOW THROUGH NOZZLES

Nozzle Label	Input Label	Inlet Press (bar G)	Req. Flow (lit/min)	Flowrate (lit/min)	% Deviation	Req. FlowDens (lit/min /metres **2)
1	11	0.36397E+01	118.0000	122.0989	3.47	
2	10	0.36439E+01	118.0000	122.1692	3.53	
3	9	0.36590E+01	118.0000	122.4225	3.75	
4	8	0.36911E+01	118.0000	122.9578	4.20	
5	7	0.37458E+01	118.0000	123.8664	4.97	
6	6	0.38289E+01	118.0000	125.2329	6.13	
7	18	0.38792E+01	118.0000	126.0520	6.82	
8	17	0.38836E+01	118.0000	126.1243	6.88	
9	16	0.38997E+01	118.0000	126.3845	7.11	
10	15	0.39337E+01	118.0000	126.9345	7.57	
11	14	0.39918E+01	118.0000	127.8681	8.36	
12	13	0.40799E+01	118.0000	129.2722	9.55	
13	20	0.38972E+01	118.0000	126.3441	7.07	
14	21	0.38127E+01	118.0000	124.9672	5.90	
15	22	0.37570E+01	118.0000	124.0517	5.13	
16	23	0.37244E+01	118.0000	123.5123	4.67	
17	24	0.37091E+01	118.0000	123.2571	4.46	
18	25	0.37048E+01	118.0000	123.1863	4.40	
19	31	0.33437E+01	64.0000	64.0000 *	0.00	
20	32	0.33437E+01	64.0000	64.0000	0.00	
21	33	0.32190E+01	48.9000	53.8244	10.07	
22	34	0.32190E+01	48.9000	53.8244	10.07	

Note: A * after a value indicates that this is a specification
1

FLOW AT INLETS

Inlet Node	Pressure (bar G)	Flowrate (lit/min)	Equivalent K-factor (lit/min , bar G)
1	5.635	2482.	1045.7

Note: A * after a value indicates that this is a specification
1

Materials Take-off

Pipe lengths

ANSI B36.10 Sch.40

Nom. Size (inches)	Tot. Length (metres)	Nom. Size (inches)	Tot. Length (metres)	Nom. Size (inches)	Tot. Length (metres)	Nom. Size (inches)	Tot. Length (metres)	Nom. Size (inches)	Tot. Length (metres)
1.000	24.00								
1.500	27.60								
2.000	31.80								
4.000	25.60								

1

Materials Take-off

Nozzles

Type	K-Factor	Number
Nozzles for GC	64.0000	18
Nozzles for vessels 1	35.0000	2
Nozzles for vessels	30.0000	2

1

Materials Take Off

Fittings

Fitting Nominal Size (inches)	Fitting Type 1	2	3	4	5	6	7	8	9
1.000	0	1	0	2	0	0	0	0	0
1.500	0	1	0	1	0	0	0	0	0
2.000	0	2	0	0	0	0	0	0	0
4.000	0	1	0	2	0	0	0	0	0

Fitting Types are :

1 -- 45 Deg Elbow	4 -- Tee or Cross	7 -- Non-Return Valve
2 -- 90 Deg Standard Elbow	5 -- Gate Valve	8 -- Ball Valve
3 -- 90 Deg Long Radius Elbow	6 -- Swing Check Valve	9 -- Butterfly Valve

All fittings are as specified by user - no additional fittings have been generated automatically.

The supply demand graph is not available for the network without pump
1

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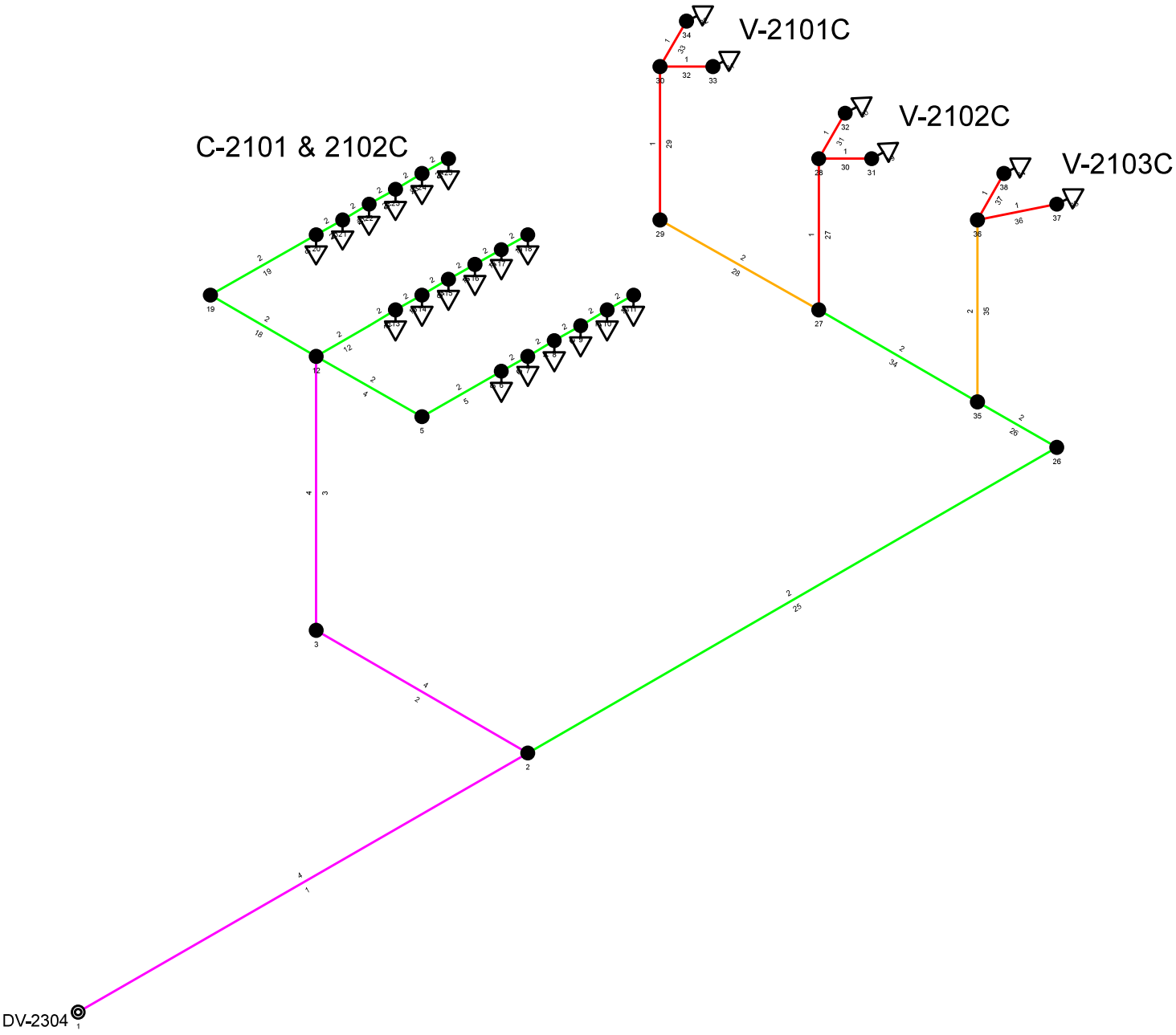
Your attention is drawn to the need to maintain adequate standards. SUNRISE SYSTEMS Ltd has itself taken steps to ensure that this program produces valid results when properly used. Users are reminded of their responsibilities in the application of program results and, in particular, you should ensure that pertinent output documents are examined and approved by qualified staff prior to use.

1

COMMENTS

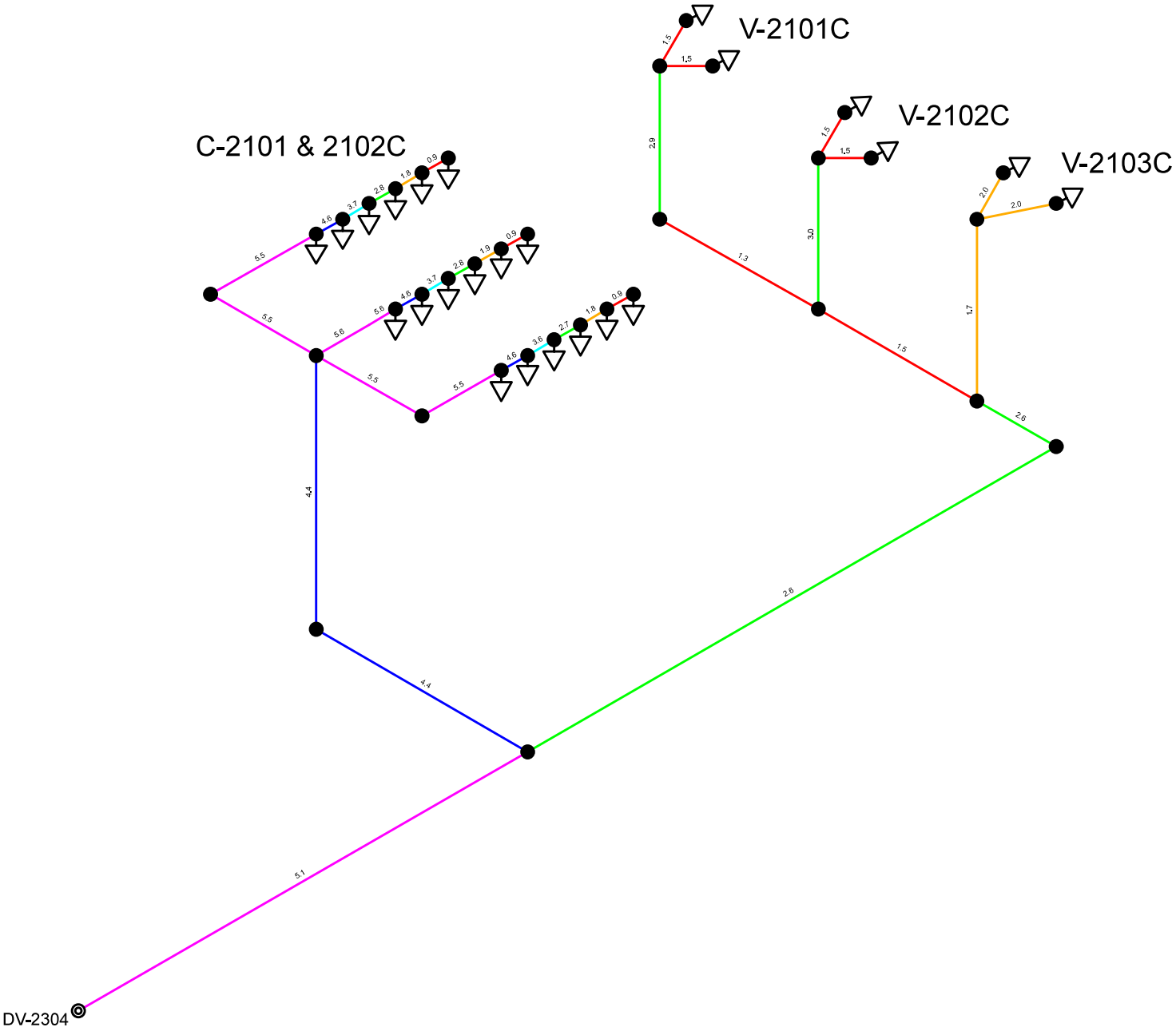
Analysis Converged in 3 Iterations
1

Att.2.4



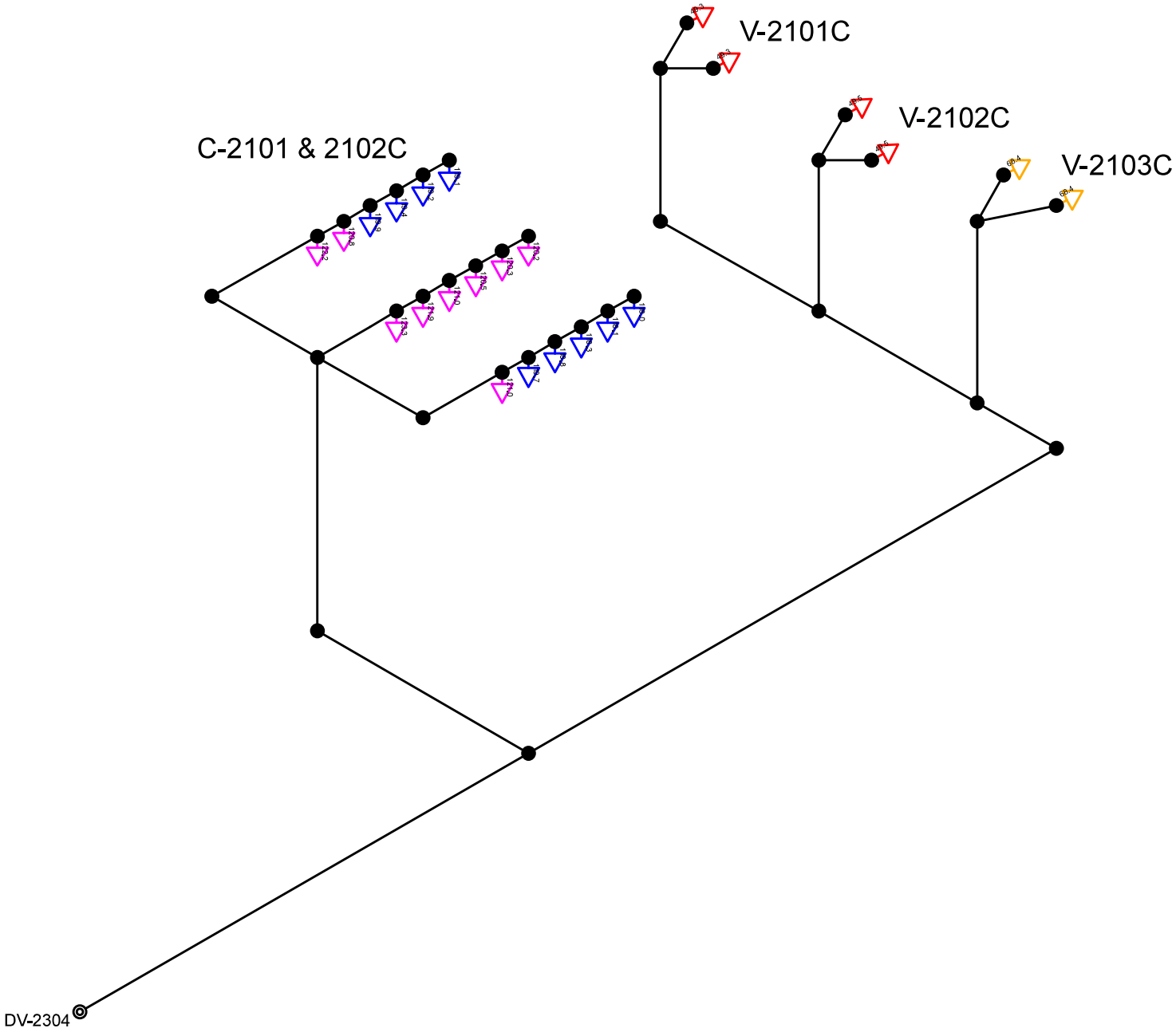
PIPENET Schematic	Saturday, May 14, 2022	Page 1 of 1

Pipe bore (in)	< 1.500000	< 2.000000	< 2.500000
	< 3.000000	< 3.500000	> 3.500000



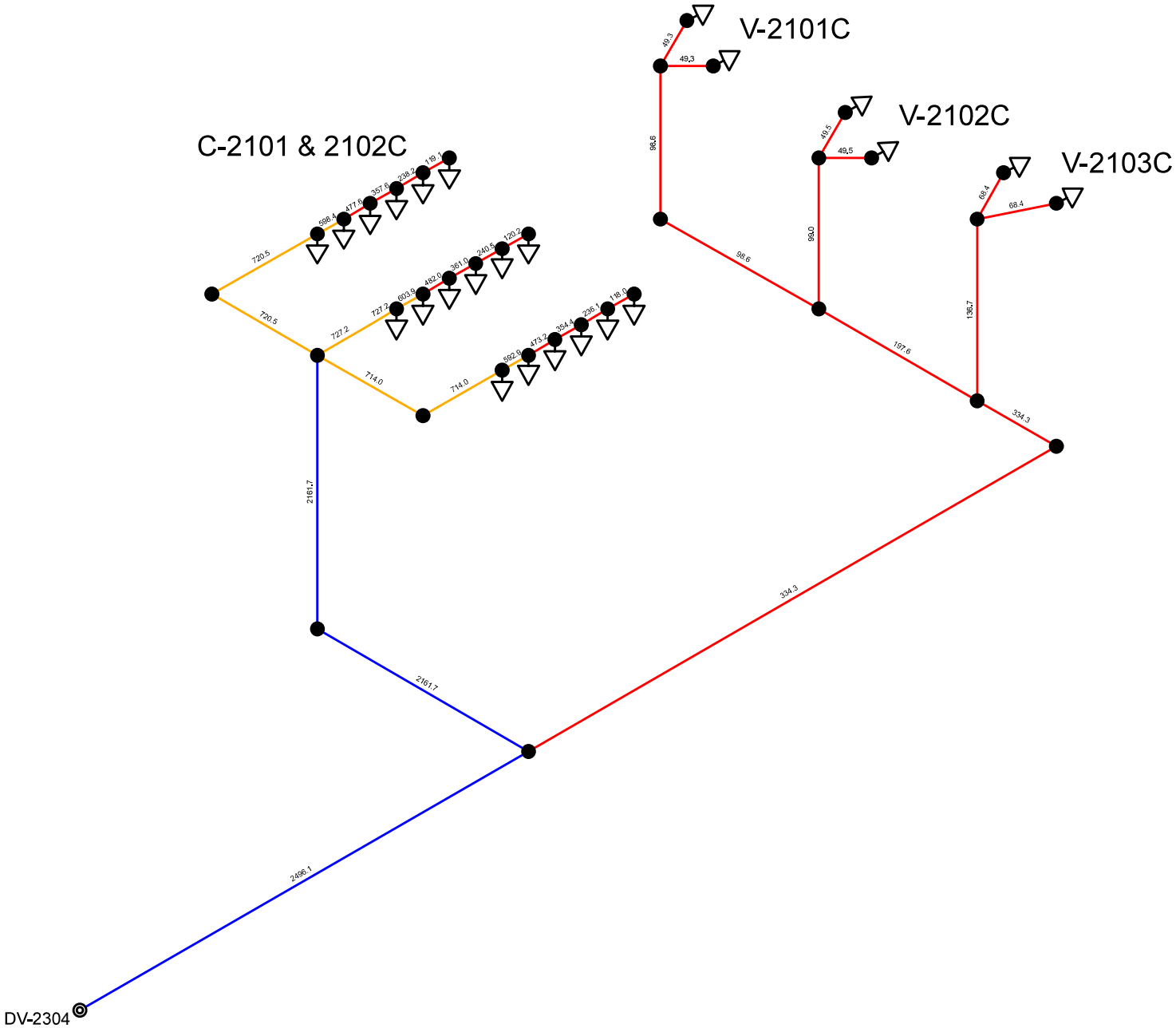
PIPENET Schematic	Saturday, May 14, 2022	Page 1 of 1

Pipe velocity (m/sec)	< 1.600000	< 2.400000	< 3.200000
	< 4.000000	< 4.800000	> 4.800000



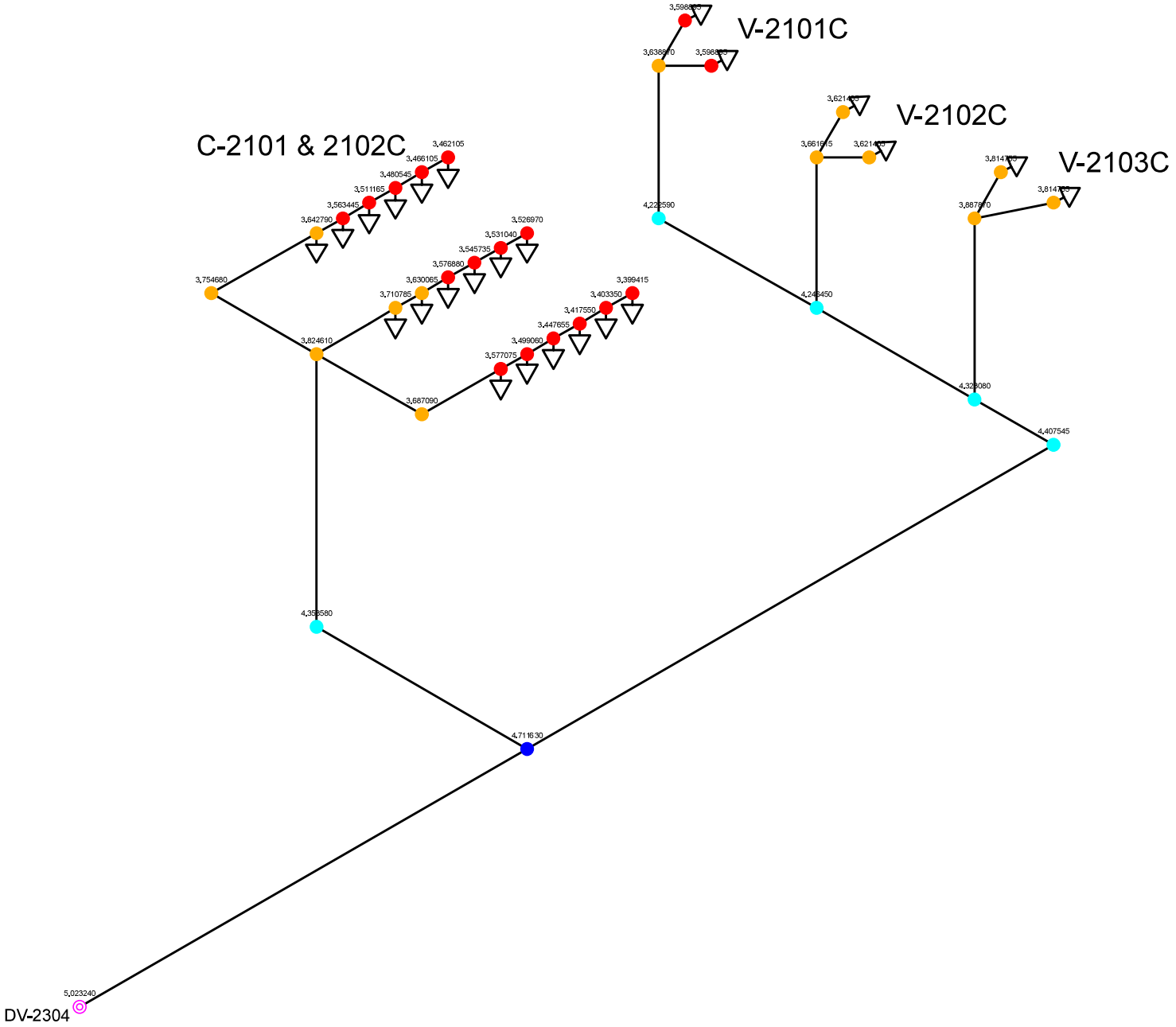
PIPENET Schematic	Saturday, May 14, 2022	Page 1 of 1

Nozzle calc. flow (l/min)	< 60.000000	< 75.000000	< 90.000000
	< 105.000000	< 120.000000	> 120.000000



PIPENET Schematic	Saturday, May 14, 2022	Page 1 of 1

Pipe vol. flow (l/min)	< 500.000000	< 1000.000000	< 1500.000000
	< 2000.000000	< 2500.000000	> 2500.000000



PIPENET Schematic	Saturday, May 14, 2022	Page 1 of 1

==========

PIPENET SPRAY/SPRINKLER MODULE

==========

VERSION 1.8

==========

Results for :

Licence Owner from key:

Licence Type: UNKNOWN

Key number: Unavailable

MUS Date: Unavailable

==========

13:35 on 10-May-2022

LIST OF CONTENTS

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CONTROL INFORMATION

```
   Convergence accuracy      = 1.00E-03
   Maximum no. of iterations =    50
   Elevation Check Tolerance =     0.50 metres
   Warnings Control Option   =     0
   ****** Diagnostic level   =     2
```

FLUID SYSTEM

```
   Fluid Class          =  1 (Liquid             )
   Density              =   998.2     kg/cu.m
   Viscosity            =  1.0000E-03 Pa.s
```

1

DESIGN INFORMATION

Waterspray System

Pipe Materials are :

Pipe Type	Lining Type	Thickness(inches)
3 -- ANSI B36.10 Sch.40	Not Lined	

Design to NFPA 2013 Rules
Using the Hazen-Williams Equation

Velocity Pressure Model: Ignore velocity pressure

Pressure loss at entrance: Ignore

Pressure loss at exit: Ignore

1

AVAILABLE PIPE SIZES AND MAXIMUM VELOCITIES USED FOR PIPE SIZING

ANSI B36.10 Sch.40
Not lined

Nom.Bore (inches)	Act.Diam (inches)	Max.Vel. (m/sec)	Nom.Bore (inches)	Act.Diam (inches)	Max.Vel. (m/sec)	Nom.Bore (inches)	Act.Diam (inches)	Max.Vel. (m/sec)
0.6250	0.6220	4.0000						
0.7500	0.8240	4.0000						
1.0000	1.0490	4.0000						
1.2500	1.3800	4.0000						
1.5000	1.6100	4.0000						
2.0000	2.0670	4.0000						
2.5000	2.4690	4.0000						
3.0000	3.0680	4.0000						
3.5000	3.5480	4.0000						
4.0000	4.0260	4.0000						
5.0000	5.0470	4.0000						
6.0000	6.0650	4.0000						
8.0000	7.9810	4.0000						
10.0000	10.0200	4.0000						
12.0000	11.9380	4.0000						
14.0000	13.1240	4.0000						
16.0000	15.0000	4.0000						
18.0000	16.8760	4.0000						
20.0000	18.8120	4.0000						
24.0000	22.6240	4.0000						

1

PIPE CONFIGURATION

Pipe Label	Input Node	Output Node	Nom.Bore (inches)	Length (metres)	Elevation (metres)	C Factor	Fitt.eq.lnth (metres)
1	1	2	4.000	11.50	0.000	120.0	0.000
2	2	3	4.000	17.00	0.000	120.0	0.000
3	3	12	4.000	4.500	4.500	120.0	0.000
4	12	5	2.000	2.000	0.000	120.0	0.000
5	5	6	2.000	1.600	0.000	120.0	0.000
6	6	7	2.000	1.600	0.000	120.0	0.000
7	7	8	2.000	1.600	0.000	120.0	0.000

8	8	9	2.000	1.600	0.000	120.0	0.000
9	9	10	2.000	1.600	0.000	120.0	0.000
10	10	11	2.000	1.600	0.000	120.0	0.000
12	12	13	2.000	1.600	0.000	120.0	0.000
13	13	14	2.000	1.600	0.000	120.0	0.000
14	14	15	2.000	1.600	0.000	120.0	0.000
15	15	16	2.000	1.600	0.000	120.0	0.000
16	16	17	2.000	1.600	0.000	120.0	0.000
17	17	18	2.000	1.600	0.000	120.0	0.000
18	12	19	2.000	1.0000	0.000	120.0	0.000
19	19	20	2.000	1.600	0.000	120.0	0.000
20	20	21	2.000	1.600	0.000	120.0	0.000
21	21	22	2.000	1.600	0.000	120.0	0.000
22	22	23	2.000	1.600	0.000	120.0	0.000
23	23	24	2.000	1.600	0.000	120.0	0.000
24	24	25	2.000	1.600	0.000	120.0	0.000
25	2	26	2.000	18.00	0.000	120.0	0.000
26	26	35	2.000	5.000	0.000	120.0	0.000
27	27	28	1.0000	4.000	4.000	120.0	0.000
28	27	29	1.500	4.000	0.000	120.0	0.000
29	29	30	1.0000	4.000	4.000	120.0	0.000
30	28	31	1.0000	3.000	0.000	120.0	0.000
31	28	32	1.0000	3.000	0.000	120.0	0.000
32	30	33	1.0000	3.000	0.000	120.0	0.000
33	30	34	1.0000	3.000	0.000	120.0	0.000
34	35	27	2.000	12.00	0.000	120.0	0.000
35	35	36	1.500	4.000	4.000	120.0	0.000
36	36	37	1.0000	3.000	0.000	120.0	0.000
37	36	38	1.0000	3.000	0.000	120.0	0.000

1

PIPE FITTINGS

Pipe	Number x Type	Equivalent Length

Label (metres)

Fitting types are :
1 -- 45 Deg Elbow
2 -- 90 Deg Standard Elbow
3 -- 90 Deg Long Radius Elbow
4 -- Tee or Cross (Flow Turned Thro 90 Deg)
5 -- Gate Valve
6 -- Swing Check Valve
7 -- Non-Return Valve
8 -- Ball Valve
9 -- Butterfly Valve
1

NOZZLE CONFIGURATION

Nozzle Label	Input Node	Nozzle Type	K-Factor	Req Flow (lit/min)	Min Press (bar G)	Max Press (bar G)
1	11	1	64.0000	118.0000	0.25000E+01	0.40000E+01
2	10	1	64.0000	118.0000	0.25000E+01	0.40000E+01
3	9	1	64.0000	118.0000	0.25000E+01	0.40000E+01
4	8	1	64.0000	118.0000	0.25000E+01	0.40000E+01
5	7	1	64.0000	118.0000	0.25000E+01	0.40000E+01
6	6	1	64.0000	118.0000	0.25000E+01	0.40000E+01
7	18	1	64.0000	118.0000	0.25000E+01	0.40000E+01
8	17	1	64.0000	118.0000	0.25000E+01	0.40000E+01
9	16	1	64.0000	118.0000	0.25000E+01	0.40000E+01
10	15	1	64.0000	118.0000	0.25000E+01	0.40000E+01
11	14	1	64.0000	118.0000	0.25000E+01	0.40000E+01
12	13	1	64.0000	118.0000	0.25000E+01	0.40000E+01
13	20	1	64.0000	118.0000	0.25000E+01	0.40000E+01
14	21	1	64.0000	118.0000	0.25000E+01	0.40000E+01
15	22	1	64.0000	118.0000	0.25000E+01	0.40000E+01
16	23	1	64.0000	118.0000	0.25000E+01	0.40000E+01
17	24	1	64.0000	118.0000	0.25000E+01	0.40000E+01
18	25	1	64.0000	118.0000	0.25000E+01	0.40000E+01

19	31	2	26.0000	48.9000	0.25000E+01
0.40000E+01					
20	32	2	26.0000	48.9000	0.25000E+01
0.40000E+01					
21	33	2	26.0000	48.9000	0.25000E+01
0.40000E+01					
22	34	2	26.0000	48.9000	0.25000E+01
0.40000E+01					
23	37	3	35.0000	64.0000	0.25000E+01
0.40000E+01					
24	38	3	35.0000	64.0000	0.25000E+01
0.40000E+01					

Nozzle types are :
1 -- Nozzles for GC
2 -- Nozzles for vessels
3 -- Nozzles for vessels 1
1

DESIGNED DIAMETERS & FLOWRATES

Pipe Label	Input Node	Output Node	Flowrate (lit/min)	Pipe Type	Act. Bore (inches)	Nom. Size (inches)	Pipe Group
1	1	2	2496.0637	3	4.0260	4.0000	*
2	2	3	2161.7388	3	4.0260	4.0000	*
3	3	12	2161.7388	3	4.0260	4.0000	*
4	12	5	713.9799	3	2.0670	2.0000	*
5	5	6	713.9799	3	2.0670	2.0000	*
6	6	7	592.9354	3	2.0670	2.0000	*
7	7	8	473.2181	3	2.0670	2.0000	*
8	8	9	354.3835	3	2.0670	2.0000	*
9	9	10	236.0689	3	2.0670	2.0000	*
10	10	11	118.0003	3	2.0670	2.0000	*
12	12	13	727.2349	3	2.0670	2.0000	*
13	13	14	603.9489	3	2.0670	2.0000	*
14	14	15	482.0111	3	2.0670	2.0000	*
15	15	16	360.9699	3	2.0670	2.0000	*
16	16	17	240.4568	3	2.0670	2.0000	*
17	17	18	120.1937	3	2.0670	2.0000	*
18	12	19	720.5248	3	2.0670	2.0000	*
19	19	20	720.5248	3	2.0670	2.0000	*
20	20	21	598.3735	3	2.0670	2.0000	*
21	21	22	477.5597	3	2.0670	2.0000	*
22	22	23	357.6356	3	2.0670	2.0000	*
23	23	24	238.2355	3	2.0670	2.0000	*
24	24	25	119.0833	3	2.0670	2.0000	*
25	2	26	334.3244	3	2.0670	2.0000	*
26	26	35	334.3244	3	2.0670	2.0000	*
27	27	28	98.9562	3	1.0490	1.0000	*
28	27	29	98.6481	3	1.6100	1.5000	*
29	29	30	98.6481	3	1.0490	1.0000	*
30	28	31	49.4781	3	1.0490	1.0000	*
31	28	32	49.4781	3	1.0490	1.0000	*
32	30	33	49.3241	3	1.0490	1.0000	*
33	30	34	49.3241	3	1.0490	1.0000	*
34	35	27	197.6043	3	2.0670	2.0000	*
35	35	36	136.7201	3	1.6100	1.5000	*
36	36	37	68.3600	3	1.0490	1.0000	*

37	36	38	68.3600	3	1.0490	1.0000	*

A * indicates that this is a SET diameter

DESIGNED DIAMETERS & FLOWRATES

Pipe Materials are :

Pipe Type	Lining Type	Thickness(inches)
3 -- ANSI B36.10 Sch.40	Not Lined	

FLOW IN PIPES

Pipe Label	Input Node	Output Node	Nom.Bore (inches)	Inlet Pr. (bar G)	Outlet Pr. (bar G)	Drop in Pr. (bar)	Frict. Loss (bar)	Flowrate (lit/min)	Velocity (m/sec)
1	1	2	4.00	5.023	4.712	0.3116	0.3116	2496.	5.065
2	2	3	4.00	4.712	4.359	0.3530	0.3530	2162.	4.387
3	3	12	4.00	4.359	3.825	0.5340	9.3450E-02	2162.	4.387
4	12	5	2.00	3.825	3.687	0.1375	0.1375	714.0	5.497
5	5	6	2.00	3.687	3.577	0.1100	0.1100	714.0	5.497
6	6	7	2.00	3.577	3.499	7.8015E-02	7.8015E-02	592.9	4.565
7	7	8	2.00	3.499	3.448	5.1405E-02	5.1405E-02	473.2	3.643
8	8	9	2.00	3.448	3.418	3.0105E-02	3.0105E-02	354.4	2.728
9	9	10	2.00	3.418	3.403	1.4200E-02	1.4200E-02	236.1	1.817
10	10	11	2.00	3.403	3.399	3.9351E-03	3.9351E-03	118.0	0.9084
12	12	13	2.00	3.825	3.711	0.1138	0.1138	727.2	5.599
13	13	14	2.00	3.711	3.630	8.0720E-02	8.0720E-02	603.9	4.650
14	14	15	2.00	3.630	3.577	5.3185E-02	5.3185E-02	482.0	3.711
15	15	16	2.00	3.577	3.546	3.1145E-02	3.1145E-02	361.0	2.779
16	16	17	2.00	3.546	3.531	1.4695E-02	1.4695E-02	240.5	1.851

17	17	18	2.00	3.531	3.527	4.0700E-03	4.0700E-03
120.2	0.9253						
18	12	19	2.00	3.825	3.755	6.9930E-02	6.9930E-02
720.5	5.547						
19	19	20	2.00	3.755	3.643	0.1119	0.1119
720.5	5.547						
20	20	21	2.00	3.643	3.563	7.9345E-02	7.9345E-02
598.4	4.607						
21	21	22	2.00	3.563	3.511	5.2280E-02	5.2280E-02
477.6	3.676						
22	22	23	2.00	3.511	3.481	3.0620E-02	3.0620E-02
357.6	2.753						
23	23	24	2.00	3.481	3.466	1.4440E-02	1.4440E-02
238.2	1.834						
24	24	25	2.00	3.466	3.462	3.9999E-03	3.9999E-03
119.1	0.9168						
25	2	26	2.00	4.712	4.408	0.3041	0.3041
334.3	2.574						
26	26	35	2.00	4.408	4.323	8.4465E-02	8.4465E-02
334.3	2.574						
27	27	28	1.00	4.246	3.662	0.5848	0.1933
98.96	2.958						
28	27	29	1.50	4.246	4.223	2.3860E-02	2.3860E-02
98.65	1.252						
29	29	30	1.00	4.223	3.639	0.5837	0.1921
98.65	2.949						
30	28	31	1.00	3.662	3.621	4.0210E-02	4.0210E-02
49.48	1.479						
31	28	32	1.00	3.662	3.621	4.0210E-02	4.0210E-02
49.48	1.479						
32	30	33	1.00	3.639	3.599	3.9975E-02	3.9975E-02
49.32	1.474						
33	30	34	1.00	3.639	3.599	3.9975E-02	3.9975E-02
49.32	1.474						
34	35	27	2.00	4.323	4.246	7.6630E-02	7.6630E-02
197.6	1.521						
35	35	36	1.50	4.323	3.888	0.4352	4.3637E-02
136.7	1.735						
36	36	37	1.00	3.888	3.815	7.3115E-02	7.3115E-02
68.36	2.043						
37	36	38	1.00	3.888	3.815	7.3115E-02	7.3115E-02
68.36	2.043						

1

FLOW THROUGH NOZZLES

Nozzle Label	Input Label	Inlet Press (bar G)	Req. Flow (lit/min)	Flowrate (lit/min)	% Deviation	Req. FlowDens (lit/min /metres **2)
1	11	0.33994E+01	118.0000	118.0000 *	0.00	
2	10	0.34034E+01	118.0000	118.0683	0.06	
3	9	0.34176E+01	118.0000	118.3143	0.27	
4	8	0.34477E+01	118.0000	118.8343	0.71	
5	7	0.34991E+01	118.0000	119.7169	1.46	
6	6	0.35771E+01	118.0000	121.0442	2.58	
7	18	0.35270E+01	118.0000	120.1934	1.86	
8	17	0.35310E+01	118.0000	120.2628	1.92	
9	16	0.35457E+01	118.0000	120.5127	2.13	

10	15	0.35769E+01	118.0000	121.0409	2.58
11	14	0.36301E+01	118.0000	121.9375	3.34
12	13	0.37108E+01	118.0000	123.2858	4.48
13	20	0.36428E+01	118.0000	122.1510	3.52
14	21	0.35634E+01	118.0000	120.8134	2.38
15	22	0.35112E+01	118.0000	119.9239	1.63
16	23	0.34805E+01	118.0000	119.3998	1.19
17	24	0.34661E+01	118.0000	119.1519	0.98
18	25	0.34621E+01	118.0000	119.0831	0.92
19	31	0.36214E+01	48.9000	49.4780	1.18
20	32	0.36214E+01	48.9000	49.4780	1.18
21	33	0.35989E+01	48.9000	49.3240	0.87
22	34	0.35989E+01	48.9000	49.3240	0.87
23	37	0.38148E+01	64.0000	68.3599	6.81
24	38	0.38148E+01	64.0000	68.3599	6.81

Note: A * after a value indicates that this is a specification
1

FLOW AT INLETS

Inlet Node	Pressure (bar G)	Flowrate (lit/min)	Equivalent K-factor (lit/min , bar G)
1	5.023	2496.	1113.7

Note: A * after a value indicates that this is a specification
1

Materials Take-off

Pipe lengths

ANSI B36.10 Sch.40

Nom. Size (inches)	Tot. Length (metres)	Nom. Size (inches)	Tot. Length (metres)	Nom. Size (inches)	Tot. Length (metres)	Nom. Size (inches)	Tot. Length (metres)	Nom. Size (inches)	Tot. Length (metres)
1.000	26.00								
1.500	8.000								
2.000	66.80								
4.000	33.00								

1

Materials Take-off

Nozzles

Type	K-Factor	Number
Nozzles for GC	64.0000	18
Nozzles for vessels	26.0000	4
Nozzles for vessels 1	35.0000	2

1

Materials Take Off

Fittings

Fitting Nominal Size (inches)	Fitting Type 1	2	3	4	5	6	7	8	9

Fitting Types are :

1 -- 45 Deg Elbow	4 -- Tee or Cross	7 -- Non-Return Valve
2 -- 90 Deg Standard Elbow	5 -- Gate Valve	8 -- Ball Valve
3 -- 90 Deg Long Radius Elbow	6 -- Swing Check Valve	9 -- Butterfly Valve

All fittings are as specified by user - no additional fittings have been generated automatically.

The supply demand graph is not available for the network without pump

1

IMPORTANT NOTICE

Your attention is drawn to the need to maintain adequate standards. SUNRISE SYSTEMS Ltd has itself taken steps to ensure that this program produces valid results when properly used. Users are reminded of their responsibilities in the application of program results and, in particular, you should ensure that pertinent output documents are examined and approved by qualified staff prior to use.

1

COMMENTS

Analysis Converged in 3 Iterations
1