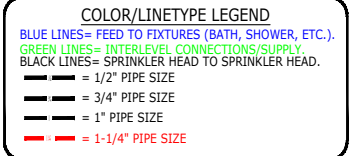
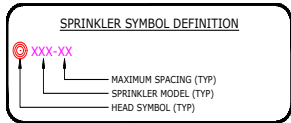
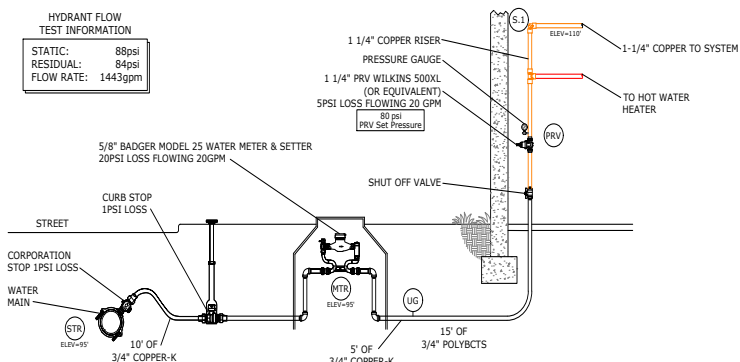


Markup Legend	
Delete Line	
Add Line	
Add Tee	
Add Elbow	
Add Coupling	
Add Head	
Delete Head	
Move Head	



HYDRANT FLOW
 TEST INFORMATION
 STATIC: 88psi
 RESIDUAL: 84psi
 FLOW RATE: 1443gpm



4 WATER SERVICE DETAIL

F100 NTS

MOST HYDRAULICALLY REMOTE HEADS		
HEAD #	GPM	PRESSURE REQ'D AT STREET
1 HEAD H.1	14	69.58
2 HEAD H.11 & H.9	19.9956	72.75

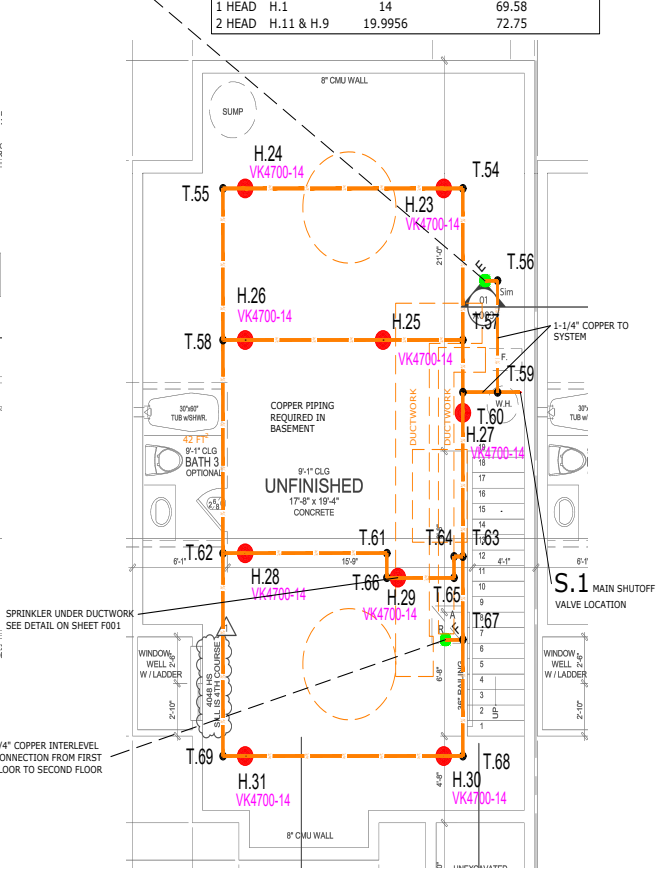
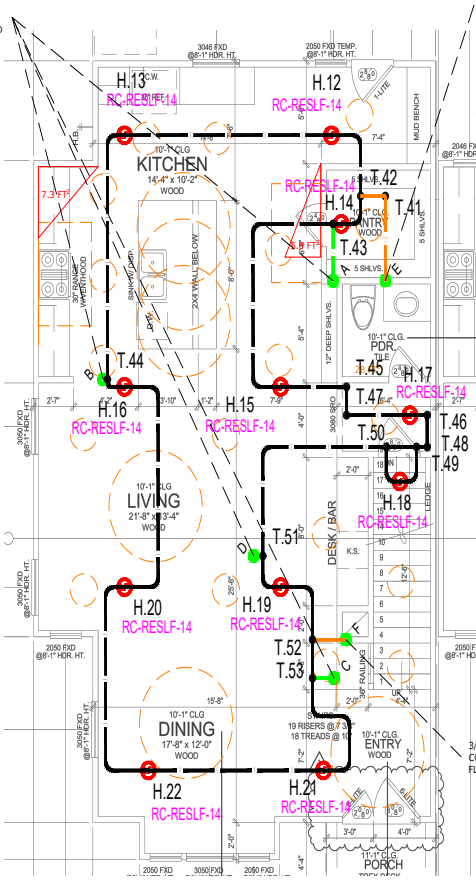
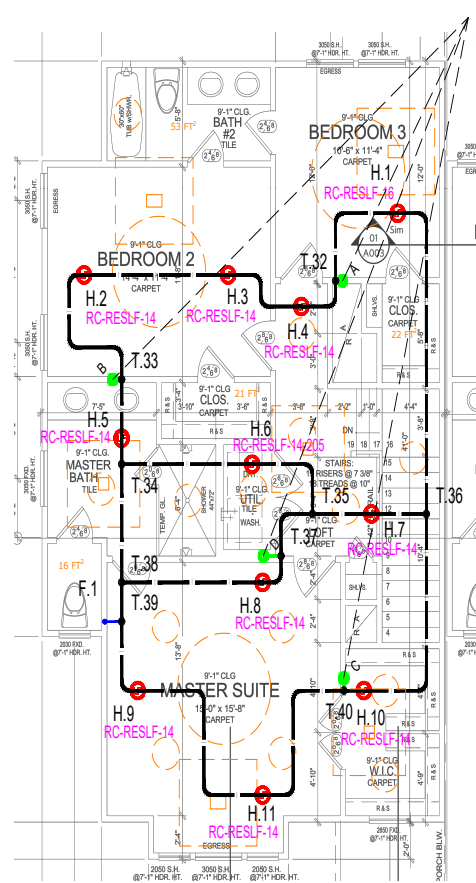
Multipurpose Fire Safety Systems
 The Uponor Residential Fire Safety System is a residential fire protection system installed in combination with the cold side of the domestic potable water system. Only licensed contractors trained by Uponor can install this system.

What to do if Changes are Required
 If any features or obstructions require the addition or deletion of sprinkler heads, or significant relocation of sprinkler heads, contact the Uponor Design Department to determine if observed changes require a redesign (888.594.7726).

- RC-RESLF-16 SENJU Model RC-RESLF37 LowFlow K3.7 Residential Concealed Pendant SS8261 K=3.7, 162F°, 7/16" Orifice, Maximum Spacing 16"x16" Sprinkler head demand: 14 gpm @ 14.3
- RC-RESLF-14 SENJU Model RC-RESLF37 LowFlow K3.7 Residential Concealed Pendant SS8261 K=3.7, 162F°, 7/16" Orifice, Maximum Spacing 14"x14" Sprinkler head demand: 10 gpm @ 7.3
- RC-RESLF-14-205 SENJU Model RC-RESLF37 LowFlow K3.7 Residential Concealed Pendant SS8261 K=3.7, 205F°, 7/16" Orifice, Maximum Spacing 14"x14" Sprinkler head demand: 11 gpm @ 8.8
- VK4700-14 VIKING Model VK4700 Residential Recessed Pendant Low Flow K=3, 155F°, 3/8" Orifice, Maximum Spacing 14"x14" Sprinkler head demand: 10 gpm @ 11.11

LOW FLOW SPRINKLERS SPACED AT 14"x14"
 8'-0" MINIMUM SPACING BETWEEN SPRINKLERS AND
 14'-0" MAXIMUM SPACING BETWEEN SPRINKLERS.
 7'-0" MAXIMUM FROM WALLS.

LOW FLOW SPRINKLERS SPACED AT 16"x16"
 8'-0" MAXIMUM FROM WALLS.



uponor

DESIGN SERVICES
 2923 148th Street West
 Apple Valley, MN 55124
 TEL: 888.594.7726
 EMAIL: DESIGN.SERVICES@UPONOR.COM
 WEB: WWW.UPONOR-USA.COM

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SALES REP:

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a NICET Certified.

Tim McDonald
 Tim McDonald Date: 09/21/2023
 NICET Certification No. 150393
 Water-Based Systems Layout - Level III
 Certification Expires: June 1, 2025

NLV DEVELOPMENT - UNIT E1.1	
LONGVIEW & KESSLER	
LEES SUMMIT, MO 6481	
PROJECT NUMBER: 44424F-003	COMPANY: S.B.B. PLUMBING INC.
DRAWN BY: BRUCE GUSTAFSON	CONTACT PH. NUMBER: 918.616.9275
CHECKED BY: BRUCE GUSTAFSON	CONTACT PH. NUMBER: 918.616.9275
DATE: 08/12/2023	DATE: 08/12/2023
PILOT DATE: 08/12/2023	PILOT DATE: 08/12/2023
SQUARE FEET: 2880 SQ. FT.	SCALE: 1/4" = 1'-0"
NO.	DATE
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SHEET DESCRIPTION
 ALL FLOORS

SHEET NUMBER
F100

SPRINKLER SYMBOL DEFINITION

XXX-XX

MAXIMUM SPACING (TYP)

SPRINKLER MODEL (TYP)

HEAD SYMBOL (TYP)

COLOR/LINETYPE LEGEND

BLUE LINES= FEED TO FIXTURES (BATH, SHOWER, ETC.).
GREEN LINES= INTERLEVEL CONNECTIONS/SUPPLY.
BLACK LINES= SPRINKLER HEAD TO SPRINKLER HEAD.

— — = 1/2" PIPE SIZE
— — — = 3/4" PIPE SIZE
— — — — = 1" PIPE SIZE
— — — — — = 1-1/4" PIPE SIZE

Johnson

DESIGN SERVICES
5925 148th Street west, APPLE VALLEY, MN 55124
F 888.594.7726 F 952.997.1731
MAIL DESIGN-SERVICES@UPONOR.COM

1100

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Tim W McDonald Date: 09/21/2023
NICET Certification No. 150393
Water-Based Systems Layout - Level II
Certification Expires: June 1, 2025

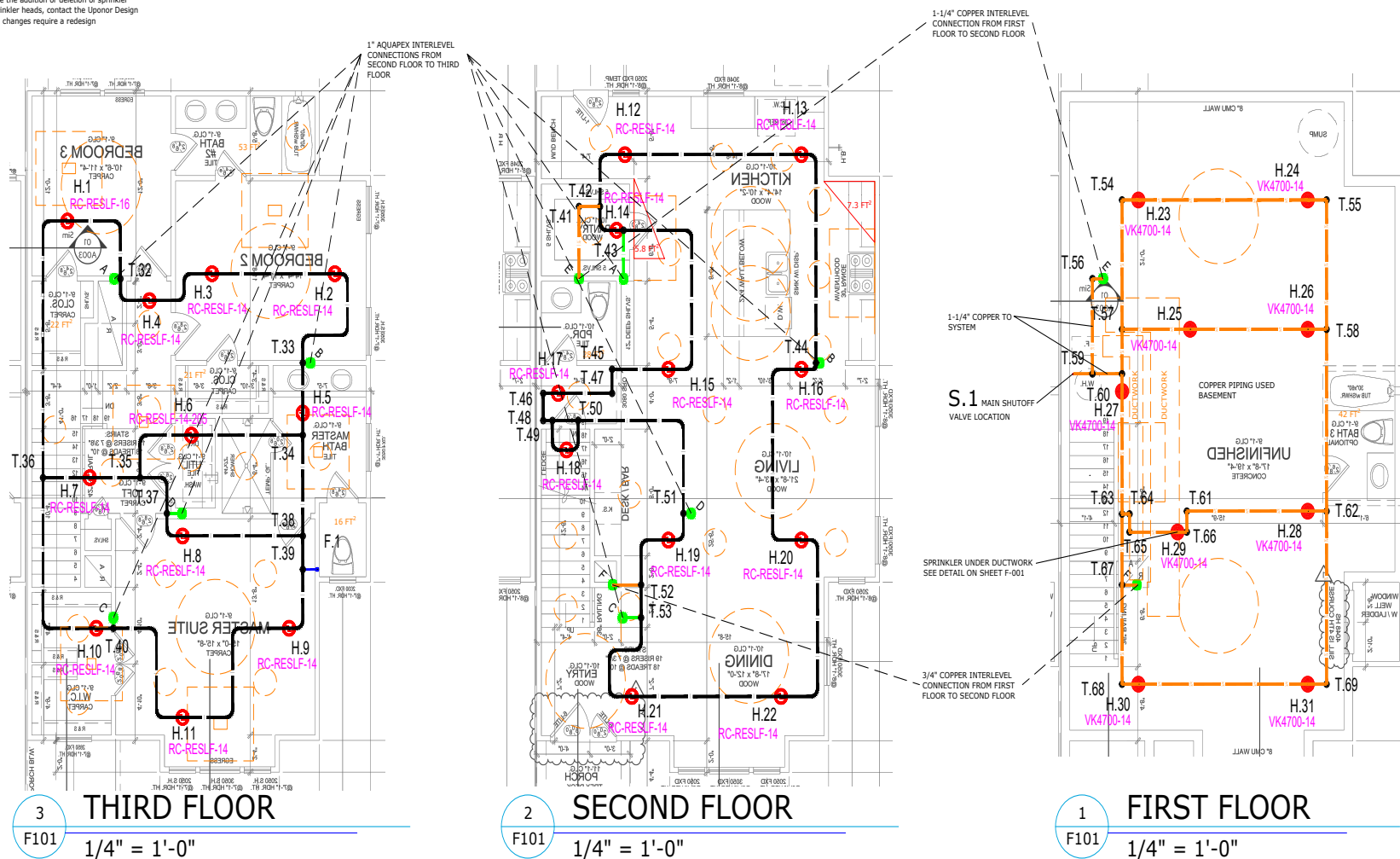
PNLV DEVELOPMENT - UNIT E1.1
LONGVIEW & KESSLER
LEES SUMMIT, MO 6481

PROJECT NUMBER:	444242 003	COMPANY:	S & B PLUMBING INC.
DRAWN BY:	TIM McDONALD	CONTACT:	MIKE STOREY
CHECKED BY:	BRIENT KOTJALA	CONTACT PH. NUMBER:	913.681.1075
DATE:	08/12/2023	PROJECT ID:	
ISSUE NUMBER:	113889	PLOT DATE:	08/12/2023
SQUARE FEET:	2880 SQ. FT.	SHEET SCALE:	1/4" = 1'-0"
REVISES			
NO.	DATE	DESCRIPTION	

SHEET DESCRIPTION
ALL FLOORS MIRROR

SHEET NUMBER

F101



© UPONOR - CONFIDENTIAL

THIS SYSTEM IS DESIGNED AS PER NFPA 13D 2019 EDITION AS A RESIDENTIAL MULTIPURPOSE SYSTEM SECTION 3.3.12.3.

2. UPONOR COMPANY RESERVES THE EXCLUSIVE RIGHTS TO ALL DETAILS AND DRAWINGS AS SHOWN ON THIS SHEET. THESE DETAILS AND DRAWINGS ARE PROPRIETARY INFORMATION OF UPONOR COMPANY AND UNAUTHORIZED USE MAY BE SUBJECT TO PROSECUTION TO THE FULL EXTENT OF THE LAW.

3. THE DESIGN OF THIS SYSTEM IS DICTATED BY SPECIFIC CEILING HEIGHTS AND ROOM SIZES. IT IS THE RESPONSIBILITY OF THE INSTALLING CONTRACTOR TO ENSURE THAT THE CONDITIONS SHOWN ON THESE PLANS ARE EXACTLY AS THEY EXIST IN THE FIELD. DEVIATIONS FROM THE DESIGN MAY CAUSE THE SYSTEM TO BE UNABLE TO CONTROL A FIRE. IF THE BUILDING CONSTRUCTION DIFFERS FROM THE FIRE SPRINKLER PLAN, CONTACT THE SYSTEM DESIGNER IMMEDIATELY.

4. THIS SYSTEM AND THE ACCOMPANYING HYDRAULIC CALCULATIONS ARE DESIGNED IN COMPLIANCE WITH NFPA 13D 2019 EDITION.

5. "STAND-ALONE" OR "MULTIPURPOSE, WET PIPE" SYSTEMS ARE PERMITTED TO ONLY USE ANTI-FREEZE LISTED FOR USE IN NEW SPRINKLER SYSTEMS.

6. MODIFICATIONS ARE PROHIBITED. SPRINKLERS THAT HAVE BEEN PAINTED, CAULKED, MODIFIED OR DAMAGED MUST BE REPLACED.

7. A SINGLE CONTROL VALVE ARRANGED TO SHUT OFF BOTH THE DOMESTIC SYSTEM AND THE SPRINKLER SYSTEM SHALL BE INSTALLED.

8. OWNERS MANUAL MUST BE PROVIDED TO THE OWNER.

9. AT THE MAIN SHUT OFF VALVE, A TAG OR A SIGN STATING THE FOLLOWING IS REQUIRED; "WARNING: THE WATER SUPPLY FOR THIS HOME SUPPLIES FIRE SPRINKLERS THAT REQUIRE CERTAIN FLOWS AND PRESSURES TOIGHT A FIRE. DEVICES THAT RESTRICT THE FLOW OR DECREASE THE PRESSURE OR AUTOMATICALLY SHUT OFF THE WATER TO THE FIRE SPRINKLER SYSTEM, SUCH AS WATER SOFTENERS, FILTRATION SYSTEMS AND AUTOMATIC SHUT OFF VALVES, **SHALL NOT** BE ADDED TO THIS SYSTEM WITHOUT THE VIEW OF THE FIRE SPRINKLER SYSTEM BY A FIRE PROTECTION SPECIALIST. **DO NOT REMOVE THIS SIGN.**"

10. ALL INTERIOR PIPING TO BE SUPPORTED "Aquapex®" UNLESS NOTED.

11. UPONOR "Aquapex" TUBING TO BE SUPPORTED PER NFPA 13D AND MANUFACTURER'S RECOMMENDATIONS.

12. MINIMUM SPACING BETWEEN SPRINKLERS IS 8'-0" REFER TO SPACING CHARTS FOR MAXIMUM SPACING BETWEEN SPRINKLERS AND FROM WALLS. SPRINKLER HEAD MANUFACTURERS MAY HAVE MORE RESTRICTIVE SPACING LIMITATIONS.

13. SPRINKLERS ARE NOT NECESSARILY CENTERED IN ROOMS DUE TO LIGHT FIXTURES OR OTHER CEILING MOUNTED OBSTRUCTIONS.

14. THE PLUMBING TIE IN CONNECTIONS ARE SCHEMATIC IN NATURE AND CAN BE INSTALLED OFF THE SPRINKLER LUMP ANYWHERE BETWEEN SPRINKLER TO SPRINKLER CONNECTION.

15. THIS SUGGESTED LAYOUT IS BASED UPON INFORMATION PROVIDED BY OTHERS. CHANGES IN CONSTRUCTION OR FIELD CONDITIONS MAY OCCUR WHICH MAY REQUIRE CHANGES TO THE LAYOUT. IT IS THE RESPONSIBILITY OF THE INSTALLER TO NOTIFY UPONOR TECHNICAL SERVICES OF SUCH CHANGES.

16. NFPA 13D 8.2.5* OBSTRUCTIONS TO RESIDENTIAL SPRINKLERS

8.2.5.1* SHADOW AREAS SHALL BE PERMITTED IN THE PROTECTION AREA OF A SPRINKLER AS LONG AS THE CIRCUMFERENCE OF DRY AREAS DO NOT EXCEED 220 SQUARE INCHES (1.7 M²)

8.2.5.2* SMALL AREAS CREATED BY ARCHITECTURAL FEATURES, SUCH AS PLANTER BOX WINDOWS, BAY WINDOWS, AND SIMILAR FEATURES, SHALL BE EVALUATED AS FOLLOWS:

(1) WHERE NO ADDITIONAL FLOOR AREA IS CREATED BY THE ARCHITECTURAL FEATURE, NO ADDITIONAL SPRINKLER PROTECTION IS REQUIRED.

(2) WHERE ADDITIONAL FLOOR AREA IS CREATED BY AN ARCHITECTURAL FEATURE, NO ADDITIONAL SPRINKLER PROTECTION IS REQUIRED, PROVIDED ALL OF THE FOLLOWING CONDITIONS ARE MET;

(3) THE FLOOR AREA SHALL NOT BE GREATER THAN 220 SQUARE INCHES (1.7 M²)

(4) THE FLOOR AREA SHALL NOT BE GREATER THAN 24 INCHES IN DEPTH AT THE DEEPEST POINT OF THE ARCHITECTURAL FEATURE TO THE PLANE OF THE PRIMARY WALL WHERE MEASURED ALONG THE FINISHED FLOOR.

(5) THE FLOOR SHALL NOT BE GREATER THAN 9FT IN LENGTH WHERE MEASURED ALONG THE PLANE OF THE PRIMARY WALL.

(6) MEASURED FROM THE DEEPEST POINT OF THE ARCHITECTURAL FEATURE TO THE SPRINKLER SHALL NOT EXCEED THE MAXIMUM LISTED SPACING OF THE SPRINKLER.

(7) THE HYDRAULIC DESIGN SHALL NOT BE REQUIRED TO CONSIDER THE AREA CREATED BY THE ARCHITECTURAL FEATURE.

17. NFPA 13D 8.3 LOCATION OF SPRINKLERS.

8.3.1 SPRINKLERS SHALL BE INSTALLED IN ALL AREAS EXCEPT WHERE OMISSION IS PERMITTED BY 8.3.2 THROUGH 8.3.8.

8.3.2 SPRINKLERS SHALL NOT BE REQUIRED IN BATHROOMS OF 55 FT² (5.1 M²) AND LESS

8.3.3 SPRINKLERS SHALL NOT BE REQUIRED IN CLOTHES CLOSETS, LINEN CLOSETS, AND PANTRIES THAT MEET ALL OF THE FOLLOWING CONDITIONS:

(1) THE AREA OF THE SPACE DOES NOT EXCEED 24 FT² (2.2 M²).

(2) THE WALLS AND CEILINGS ARE SURFACED WITH NONCOMBUSTIBLE OR LIMITED-COMBUSTIBLE MATERIALS AS DEFINED IN NFPA 921, 2017 EDITION ON TYPES OF BUILDING CONSTRUCTION.

8.3.4* SPRINKLERS SHALL NOT BE REQUIRED IN GARAGES, OPEN ATTACHED PORCHES, CARPORTS, AND SIMILAR STRUCTURES

8.3.5 SPRINKLERS SHALL NOT BE REQUIRED IN ATTICS WITH OR WITHOUT STORAGE, PENTHOUSE EQUIPMENT, MECHANICAL, ELEVATOR MACHINE ROOMS, CONCEALED SPACES DEDICATED EXCLUSIVELY TO AND CONTAINING ONLY DWELLING UNIT VENTILATION EQUIPMENT, FLOOR/CEILING SPACES, ELEVATOR SHAFTS CRAWL SPACES, AND OTHER CONCEALED SPACES THAT ARE NOT USED OR INTENDED FOR LIVING PURPOSES.

8.3.5.1* SUCH SPACES THAT CONTAIN FUEL-FIRED EQUIPMENT SHALL ALSO COMPLY WITH 8.3.5.1.1 OR 8.3.5.1.2.

8.3.5.1.1 WHERE THE FUEL-FIRED EQUIPMENT IS ABOVE ALL OF THE OCCUPIED AREAS OF THE DWELLING UNIT, NO SPRINKLER PROTECTION SHALL BE REQUIRED IN THE CONCEALED SPACE.

8.3.5.1.2 WHERE THE FUEL-FIRED EQUIPMENT IS BELOW OR ON THE SAME LEVEL AS OCCUPIED AREAS OF THE DWELLING UNIT, AT LEAST ONE QUICKRESPONSE INTERMEDIATE TEMPERATURE SPRINKLER SHALL BE INSTALLED ABOVE THE EQUIPMENT OR AT THE WALL SEPARATING THE SPACE WITH THE FUEL-FIRED EQUIPMENT FROM THE OCCUPIED SPACE.

8.3.6 SPRINKLERS SHALL NOT BE REQUIRED IN UNHEATED ENCLOSURES AT THE BUILDING AT ENTRANCES/EXITS AS LONG AS THE DWELLING UNIT HAS ANOTHER ENTRANCE/EXIT.

8.3.7 SPRINKLERS SHALL NOT BE REQUIRED FOR CEILING POCKETS THAT MEET THE FOLLOWING CONDITIONS:

(1) THE TOTAL VOLUME OF ALL UNPROTECTED CEILING POCKETS IN A COMPARTMENT DOES NOT EXCEED 100 FT³ (2.83 M³).

(2) THE ENTIRE FLOOR UNDER THE UNPROTECTED CEILING POCKET IS PROTECTED BY THE SPRINKLERS

(3) THE LOWER CEILING ELEVATION.

(3)* THE INTERIOR FINISH OF THE UNPROTECTED CEILING POCKET EXCLUDING DECORATIVE TREATMENTS IS NONCOMBUSTIBLE OR LIMITED-COMBUSTIBLE MATERIAL.

(4) SKYLIGHTS NOT EXCEEDING 32 FT² (2.97 M²) SHALL BE PERMITTED TO HAVE A PLASTIC COVER.

8.3.8 SPRINKLERS SHALL NOT BE REQUIRED IN GARAGES OR CARPORTS WITH EXTERIOR CLOSETS (REGARDLESS OF SIZE) LOCATED ON EXTERIOR BALCONIES, EXTERIOR BREEZEWAYS/CORRIDORS, OR ACCESSSED FROM OUTDOORS WHERE THE CLOSET DOES NOT HAVE DOORS OR UNPROTECTED PENETRATIONS DIRECTLY INTO THE DWELLING UNIT.

8.3.9 SPRINKLERS SHALL BE INSTALLED IN ANY CLOSET USED FOR HEATING AND/OR AIR-CONDITIONING EQUIPMENT, WASHERS AND/OR DRYERS, OR WATER HEATERS EXCEPT AS ALLOWED BY 8.3.8.

18. INSULATION GUIDE LINES PER NFPA 13D.

9.1.1* WET PIPE SYSTEMS. A WET PIPE SYSTEM SHALL BE PERMITTED TO BE TO BE USED WHERE ALL PIPING IS INSTALLED IN AREAS NOT SUBJECT TO FREEZING, INCLUDING AREAS PROPERLY INSULATED TO MAINTAIN 40°F.

9.1.1.1 AREAS SUBJECT TO FREEZING. CARE SHOULD BE TAKEN IN UNHEATED ATTIC SPACES TO COVER SPRINKLER PIPING COMPLETELY WITH INSULATION. INSTALLATION SHOULD FOLLOW THE GUIDELINES OF THE INSULATION MANUFACTURER. FIGURE A.9.1.1(A) THROUGH FIGURE A.9.1.1(F) SHOW SEVERAL METHODS THAT CAN BE CONSIDERED. THESE ARE FOR ILLUSTRATIVE PURPOSES ONLY AND NOT TO BE USED IN PLACE OF THE GENERAL CONTRACTOR AND/OR OWNER'S RECOMMENDATION TO INSURE PROPER METHODS AND MATERIALS ARE USED TO MAKE SURE 40°F WILL BE MAINTAINED.

1000

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Tim W McDonald Date: 09/21/2023

NICET Certification No. 150393

Water-Based Systems Layout - Level III

Certification Expires: June 1, 2025

Uponor

AquaSAFE™ Fire Safety System

Uponor
5925 148th Street West
Apple Valley, MN 55124
800-321-4739

Job Name : NLV DEVELOPMENT - UNIT E1.1 - One Head Calculation (H.1)
Drawing : RESIDENTIAL
Location : LONGVIEW & KESSLER LEES SUMMIT MO 6481
Remote Area : 1
Contract : 44424F 003
Data File : 44424F 003 NLV Development - Longview & Kessler - Fire, Unit
Date/Time : 09/21/2023 - 05:58 AM

HYDRAULIC DESIGN INFORMATION SHEET

Name - NLV DEVELOPMENT - UNIT E1.1 Date - 08/12/2023
Location - LEES SUMMIT MO 6481
Building - RESIDENTIAL System No. - 1
Contractor - S & B PLUMBING INC. Contract No. - 44424F 003
Calculated By - TIM McDONALD Drawing No. - F100
Construction: (X) Combustible () Non-Combustible Ceiling Height VARIES
OCCUPANCY - RESIDENTIAL

S Type of Calculation: () NFPA 13 Residential () NFPA 13R (X) NFPA 13D
Y Number of Sprinklers Flowing: (X) 1 () 2 () 4 ()
S () Other
T () Specific Ruling Made by Date
E
M Listed Flow at Start Point - 14 Gpm System Type
Listed Pres. at Start Point - 14.3 Psi (X) Wet () Dry
D MAXIMUM LISTED SPACING 16 x 16 () Deluge () PreAction
E Domestic Flow Added - 0 Gpm Sprinkler or Nozzle
S Additional Flow Added - Gpm Make SENJU Model RC-RESLF37
I Elevation at Highest Outlet - 135 Feet Size 7/16 K-Factor 3.7
G Note: Temperature Rating 162
N

Calculation Gpm Required 14 Psi Required 69.58 At Ref Pt STR
Summary C-Factor Used: Overhead 150 Underground 150

W Water Flow Test: Pump Data: Tank or Reservoir:
A Date of Test - x Rated Cap. Cap.
T Time of Test - x @ Psi Elev.
E Static (Psi) - 88 Elev.
R Residual (Psi) - 84 Other Well
Flow (Gpm) - 1443 Proof Flow Gpm
S Elevation - 95
P Location: STREET
P
L Source of Information: CONTRACTOR
Y

Water Supply Curve

Uponor
NLV DEVELOPMENT - UNIT E1.1 - One Head Calculation (H.1)

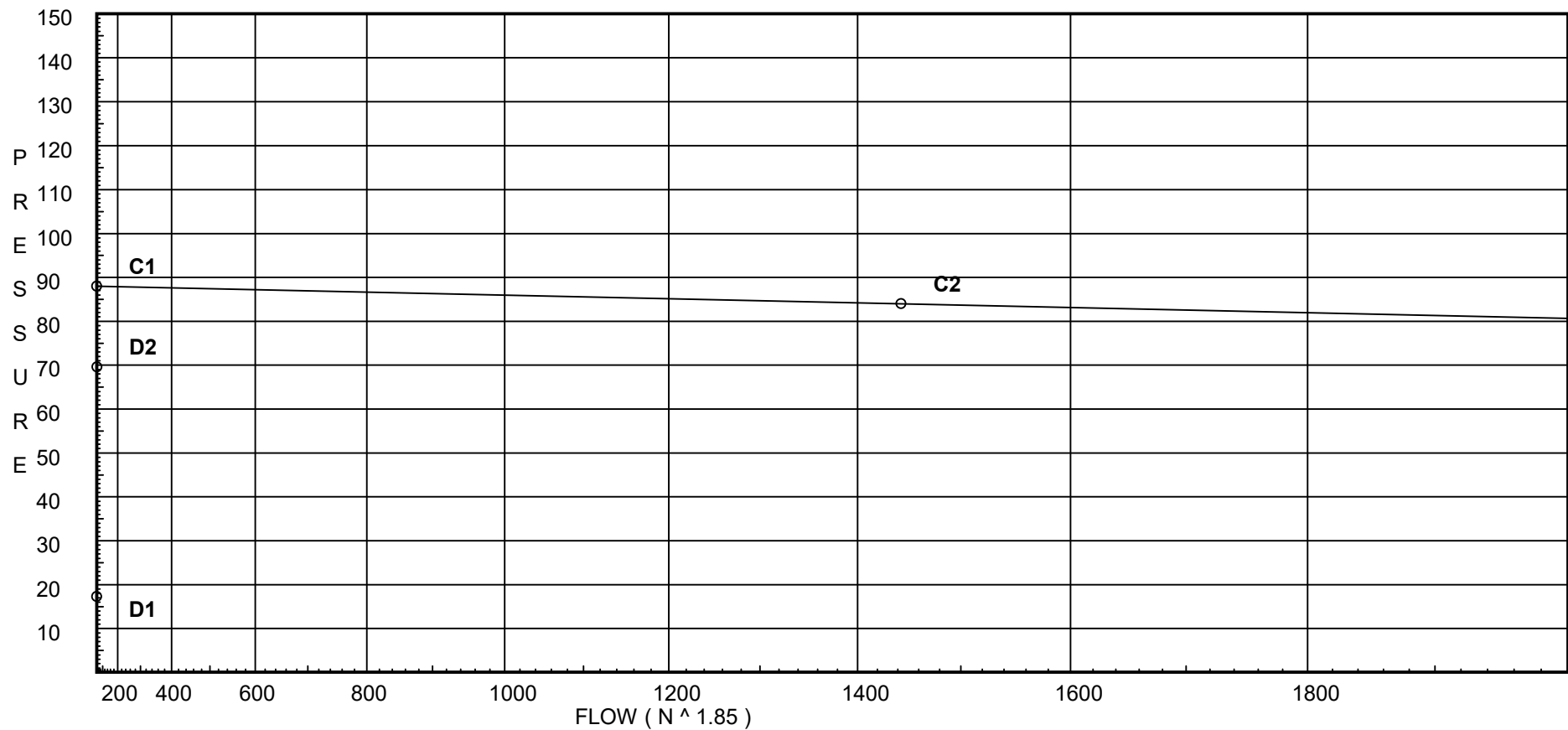
Page 2
Date 9/21/2023

City Water Supply:

C1 - Static Pressure : 88
C2 - Residual Pressure: 84
C2 - Residual Flow : 1443

Demand:

D1 - Elevation : 17.324
D2 - System Flow : 13.992
D2 - System Pressure : 69.582
Hose (Demand) :
D3 - System Demand : 13.992
Safety Margin : 18.417



Fittings Used Summary

Uponor
NLV DEVELOPMENT - UNIT E1.1 - One Head Calculation (H.1)

Page 3
Date 9/21/2023

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
Ec *	Copper 90' Ell	1	1	2	2	2.5	3.5	4	5	6	7	9	10	0	0	0	0	0	0	0	0
T	NFPA 13 90' Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121
Tc *	Copper Tee-Branch	1.5	2	2	3	3.5	5	6	7.5	9	10.5	13	15	0	0	0	0	0	0	0	0
Tcs *	Copper Cplg/Tee-Run	0.5	0.5	0.5	1	1	1	1.5	1.5	2	2	2.5	3	0	0	0	0	0	0	0	0
Uel *	Aquapex 90 Elbow	11	11	12	11	13	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utb *	Aquapex Tee - Branch	2	17	14	9	12	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utr *	Aquapex Tee - Run	1	2	2	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Units Summary

Diameter Units Inches
Length Units Feet
Flow Units US Gallons per Minute
Pressure Units Pounds per Square Inch

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.

Flow Summary - NFPA

Uponor
NLV DEVELOPMENT - UNIT E1.1 - One Head Calculation (H.1)

Page 4
Date 9/21/2023

SUPPLY ANALYSIS

<i>Node at Source</i>	<i>Static Pressure</i>	<i>Residual Pressure</i>	<i>Flow</i>	<i>Available Pressure</i>	<i>Total Demand</i>	<i>Required Pressure</i>
STR	88.0	84	1443.0	87.999	13.99	69.582

NODE ANALYSIS

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>	
H.1	135.0	3.7	14.3	13.99	0.05	256
T.36	135.0		14.84			
H.10	135.0		14.97			
T.40	135.0		14.99			
T.53	123.0		20.5			
T.52	123.0		20.52			
T.67	110.0		26.76			
T.63	110.0		26.85			
H.27	110.0		26.96			
T.60	110.0		27.0			
T.59	110.0		27.01			
S.1	108.0		28.12			
PRV	95.0		39.0			
UG	95.0		44.05			
MTR	95.0		65.23			
STR	95.0		69.58			
T.32	135.0		14.71			
T.43	123.0		20.58			
H.14	123.0		20.64			
T.42	123.0		21.06			
T.41	123.0		21.08			
T.56	110.0		26.9			
H.4	135.0		14.75			
H.3	135.0		14.81			
H.2	135.0		14.9			
T.33	135.0		14.99			
T.44	123.0		20.52			
H.13	123.0		20.7			
H.12	123.0		20.86			
H.7	135.0		14.94			
T.35	135.0		14.98			
T.37	135.0		15.01			
T.51	123.0		20.49			
H.19	123.0		20.5			
H.6	135.0		14.98			
T.34	135.0		14.99			
T.38	135.0		14.99			
H.8	135.0		15.0			
H.5	135.0		14.99			
H.11	135.0		14.99			
H.9	135.0		14.99			
T.39	135.0		14.99			

Flow Summary - NFPA

Uponor
NLV DEVELOPMENT - UNIT E1.1 - One Head Calculation (H.1)

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NODE ANALYSIS (cont.)

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>
T.50	123.0		20.5		
T.49	123.0		20.5		
T.48	123.0		20.52		
T.46	123.0		20.53		
H.17	123.0		20.53		
T.47	123.0		20.55		
T.45	123.0		20.56		
H.15	123.0		20.56		
H.18	123.0		20.5		
H.21	123.0		20.5		
H.22	123.0		20.51		
H.20	123.0		20.51		
H.16	123.0		20.52		
T.68	110.0		26.78		
H.30	110.0		26.78		
H.31	110.0		26.82		
T.69	110.0		26.83		
T.62	110.0		26.86		
T.58	110.0		26.94		
T.55	110.0		26.95		
H.24	110.0		26.95		
H.23	110.0		26.96		
T.54	110.0		26.97		
T.57	110.0		26.98		
T.64	110.0		26.85		
T.65	110.0		26.85		
H.29	110.0		26.85		
T.66	110.0		26.86		
T.61	110.0		26.86		
H.28	110.0		26.86		
H.26	110.0		26.94		
H.25	110.0		26.96		

Final Calculations : Hazen-Williams

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NLV DEVELOPMENT - UNIT E1.1 - One Head Calculation (H.1)

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
*Remote Head to Supply											
H.1 to T.36	135 135	3.70	6.04	1	Utr	2.0 20.000 2.000	150	14.300 0.0			
T.36 to H.10	135 135		6.04	0.862		22.000	0.0245	0.538	Vel =	3.32	
T.36 to H.10	135 135		-2.80	1	Utr	2.0 15.000 2.000	150	14.838 0.0			
H.10 to T.40	135 135		3.24	0.862		17.000	0.0077	0.131	Vel =	1.78	
H.10 to T.40	135 135		0.0	1	Utr	2.0 1.000 2.000	150	14.969 0.0			
T.40 to T.53	135 123		3.24	0.862		3.000	0.0080	0.024	Vel =	1.78	
T.40 to T.53	135 123		-0.10	1	2Utb	34.0 15.000 28.000	150	14.993 5.197			
T.53 to T.52	123 123		3.14	0.862		43.000	0.0073	0.313	Vel =	1.73	
T.53 to T.52	123 123		-0.53	1	Utr	2.0 2.000 2.000	150	20.503 0.0			
T.52 to T.67	123 110		2.61	0.862		4.000	0.0052	0.021	Vel =	1.43	
T.52 to T.67	123 110		1.99	0.75	2Tc	4.0 16.000 4.000	150	20.524 5.630			
T.67 to T.63	110 110		4.6	0.745		20.000	0.0302	0.603	Vel =	3.39	
T.67 to T.63	110 110		-1.27	0.75	Tcs	0.5 5.000 0.500	150	26.757 0.0			
T.63 to H.27	110 110		3.33	0.745		5.500	0.0165	0.091	Vel =	2.45	
T.63 to H.27	110 110		-0.52	0.75	Tcs	0.5 9.000 0.500	150	26.848 0.0			
H.27 to T.60	110 110		2.81	0.745		9.500	0.0120	0.114	Vel =	2.07	
H.27 to T.60	110 110		0.0	0.75	Tc Tcs	2.0 1.000 2.500	150	26.962 0.0			
T.60 to T.59	110 110		2.81	0.745		3.500	0.0120	0.042	Vel =	2.07	
T.60 to T.59	110 110		1.79	1.25	Tcs	1.0 2.000 1.000	150	27.004 0.0			
T.59 to S.1	110 108		4.6	1.245		3.000	0.0027	0.008	Vel =	1.21	
T.59 to S.1	110 108		9.39	1.25	T	5.492 7.000 5.492	150	27.012 0.866			
S.1 to PRV	108 95		13.99	1.245		12.492	0.0193	0.241	Vel =	3.69	
S.1 to PRV	108 95		0.0	1.25	E	2.746 10.000 2.746	150	28.119 10.630	** Fixed Loss = 5		
PRV to UG	95 95		13.99	1.245		12.746	0.0194	0.247	Vel =	3.69	
PRV to UG	95 95		0.0	0.75	E	1.414 15.000 1.414	150	38.996 0.0			
UG to MTR	95 95		13.99	0.705		16.414	0.3080	5.055	Vel =	11.50	
UG to MTR	95 95		0.0	0.75		5.000	150	44.051 20.000	** Fixed Loss = 20		
MTR to STR	95 95		13.99	0.745		5.000	0.2354	1.177	Vel =	10.30	
MTR to STR	95 95		0.0	0.75		10.000	150	65.228 2.000	** Fixed Loss = 2		
STR to STR	95 95		13.99	0.745		10.000	0.2354	2.354	Vel =	10.30	
STR			0.0 13.99					69.582	K Factor =	1.68	

Final Calculations : Hazen-Williams

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NLV DEVELOPMENT - UNIT E1.1 - One Head Calculation (H.1)

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
*New Path												
H.1 to T.32	135 135		7.95 7.95	1 0.862	Utr	2.0	8.000 2.000 10.000	150 0.0407	14.300 0.0 0.407		Vel = 4.37	
T.32 to T.43	135 123		-3.27 4.68	1 0.862	2Utb	34.0	16.000 28.000 44.000	150 0.0153	14.707 5.197 0.672		Vel = 2.57	
T.43 to H.14	123 123		1.02 5.7	1 0.862	Utr	2.0	1.000 2.000 3.000	150 0.0220	20.576 0.0 0.066		Vel = 3.13	
H.14 to T.42	123 123		0.0 5.7	1 0.862	Utb Utr	17.0 2.0	3.000 16.000 19.000	150 0.0219	20.642 0.0 0.417		Vel = 3.13	
T.42 to T.41	123 123		3.69 9.39	1.25 1.245			2.000 2.000	150 0.0090	21.059 0.0 0.018		Vel = 2.47	
T.41 to T.56	123 110		0.0 9.39	1.25 1.245	Ec	2.0	19.000 2.000 21.000	150 0.0092	21.077 5.630 0.194		Vel = 2.47	
T.56 to T.59	110 110		0.0 9.39	1.25 1.245	Tc Ec	3.0 2.0	7.000 5.000 12.000	150 0.0092	26.901 0.0 0.111		Vel = 2.47	
T.59			0.0 9.39						27.012		K Factor = 1.81	
*New Path												
T.32 to H.4	135 135		3.27 3.27	1 0.862	Utr	2.0	4.000 2.000 6.000	150 0.0078	14.707 0.0 0.047		Vel = 1.80	
H.4 to H.3	135 135		0.0 3.27	1 0.862			7.000 7.000	150 0.0079	14.754 0.0 0.055		Vel = 1.80	
H.3 to H.2	135 135		0.0 3.27	1 0.862	Utr	2.0	10.000 2.000 12.000	150 0.0078	14.809 0.0 0.094		Vel = 1.80	
H.2 to T.33	135 135		0.0 3.27	1 0.862	Utr	2.0	9.000 2.000 11.000	150 0.0079	14.903 0.0 0.087		Vel = 1.80	
T.33 to T.44	135 123		-0.11 3.16	1 0.862	2Utb	34.0	16.646 28.000 44.646	150 0.0074	14.990 5.197 0.331		Vel = 1.74	
T.44 to H.13	123 123		0.53 3.69	1 0.862	Utr	2.0	16.000 2.000 18.000	150 0.0098	20.518 0.0 0.177		Vel = 2.03	
H.13 to H.12	123 123		0.0 3.69	1 0.862	Utr	2.0	15.000 2.000 17.000	150 0.0098	20.695 0.0 0.167		Vel = 2.03	
H.12 to T.42	123 123		0.0 3.69	1 0.862	Utb	17.0	6.000 14.000 20.000	150 0.0099	20.862 0.0 0.197		Vel = 2.03	

Final Calculations : Hazen-Williams

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NLV DEVELOPMENT - UNIT E1.1 - One Head Calculation (H.1)

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
			0.0									
T.42			3.69						21.059	K Factor = 0.80		
*New Path												
T.36 to H.7	135		2.79	1	Utb	17.0	4.000 14.000 18.000	150	14.838 0.0 0.105	Vel = 1.53		
H.7 to T.35	135		0.0	1	Utr	2.0	4.000 2.000 6.000	150	14.943 0.0 0.036	Vel = 1.53		
T.35 to T.37	135		-0.50	1	Utr	2.0	5.000 2.000 7.000	150	14.979 0.0 0.028	Vel = 1.26		
T.37 to T.51	135		0.71	1	2Utb	34.0	14.000 28.000 42.000	150	15.007 5.197 0.282	Vel = 1.65		
T.51 to H.19	123		-1.01	1	Utr	2.0	3.000 2.000 5.000	150	20.486 0.0 0.016	Vel = 1.09		
H.19 to T.52	123		0.0	1	Utr	2.0	5.000 2.000 7.000	150	20.502 0.0 0.022	Vel = 1.09		
T.52			0.0									
T.52			1.99						20.524	K Factor = 0.44		
*New Path												
T.35 to H.6	135		0.51	1	Utb	17.0	7.000 14.000 21.000	150	14.979 0.0 0.005	Vel = 0.28		
H.6 to T.34	135		0.0	1	Utb Utr	17.0 2.0	9.000 16.000 25.000	150	14.984 0.0 0.006	Vel = 0.28		
T.34 to T.38	135		0.10	1	Utr	2.0	7.000 2.000 9.000	150	14.990 0.0 0.003	Vel = 0.34		
T.38 to H.8	135		0.11	1	Utb	17.0	10.000 14.000 24.000	150	14.993 0.0 0.012	Vel = 0.40		
H.8 to T.37	135		0.0	1	Utr	2.0	3.000 2.000 5.000	150	15.005 0.0 0.002	Vel = 0.40		
T.37			0.0									
T.37			0.72						15.007	K Factor = 0.19		
*New Path												
T.33 to H.5	135		0.10	1	Utr	2.0	3.000 2.000 5.000	150	14.990 0.0 0.0	Vel = 0.05		
H.5 to T.34	135		0.0	1	Utr	2.0	2.000 2.000 4.000	150	14.990 0.0 0.0	Vel = 0.05		

Final Calculations : Hazen-Williams

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NLV DEVELOPMENT - UNIT E1.1 - One Head Calculation (H.1)

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
T.34			0.0 0.10						14.990		K Factor = 0.03	
*New Path												
T.40 to H.11	135 135		0.11 0.11	1 0.862	Utr	2.0	12.000 2.000 14.000	150 0	14.993 0.0 0.0		Vel = 0.06	
H.11 to H.9	135 135		0.0 0.11	1 0.862			15.000 15.000	150 0	14.993 0.0 0.0		Vel = 0.06	
H.9 to T.39	135 135		0.0 0.11	1 0.862	Utr	2.0	5.000 2.000 7.000	150 0	14.993 0.0 0.0		Vel = 0.06	
T.39 to T.38	135 135		0.0 0.11	1 0.862	Utr	2.0	2.000 2.000 4.000	150 0	14.993 0.0 0.0		Vel = 0.06	
T.38			0.0 0.11						14.993		K Factor = 0.03	
*New Path												
T.51 to T.50	123 123		1.01 1.01	1 0.862	Utr	2.0	15.000 2.000 17.000	150 0.0009	20.486 0.0 0.016		Vel = 0.56	
T.50 to T.49	123 123		-0.13 0.88	1 0.862	Utr	2.0	2.000 2.000 4.000	150 0.0005	20.502 0.0 0.002		Vel = 0.48	
T.49 to T.48	123 123		0.13 1.01	1 0.862	Uel	11.0	1.000 12.000 13.000	150 0.0009	20.504 0.0 0.012		Vel = 0.56	
T.48 to T.46	123 123		0.0 1.01	1 0.862	Uel	11.0	2.000 12.000 14.000	150 0.0009	20.516 0.0 0.013		Vel = 0.56	
T.46 to H.17	123 123		0.0 1.01	1 0.862	Utr	2.0	1.000 2.000 3.000	150 0.0007	20.529 0.0 0.002		Vel = 0.56	
H.17 to T.47	123 123		0.0 1.01	1 0.862	Uel	11.0	4.000 12.000 16.000	150 0.0009	20.531 0.0 0.015		Vel = 0.56	
T.47 to T.45	123 123		0.0 1.01	1 0.862	Uel	11.0	2.000 12.000 14.000	150 0.0009	20.546 0.0 0.012		Vel = 0.56	
T.45 to H.15	123 123		0.0 1.01	1 0.862			5.000 5.000	150 0.0010	20.558 0.0 0.005		Vel = 0.56	
H.15 to T.43	123 123		0.0 1.01	1 0.862	Utr	2.0	13.000 2.000 15.000	150 0.0009	20.563 0.0 0.013		Vel = 0.56	
T.43			0.0 1.01						20.576		K Factor = 0.22	

Final Calculations : Hazen-Williams

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NLV DEVELOPMENT - UNIT E1.1 - One Head Calculation (H.1)

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
*New Path												
T.50 to H.18	123 123		0.13	0.75	Utb Utr	17.0 2.0	3.000 19.000 22.000	150 0	20.502 0.0 0.001		Vel = 0.12	
H.18 to T.49	123 123		0.0	0.75	Utb	17.0	3.000 17.000 20.000	150 0	20.503 0.0 0.001		Vel = 0.12	
T.49			0.0 0.13						20.504		K Factor = 0.03	
*New Path												
T.53 to H.21	123 123		0.53	1	Utr	2.0	6.000 2.000 8.000	150	20.503 0.0 0.002		Vel = 0.29	
H.21 to H.22	123 123		0.0	1			12.000	150	20.505 0.0		Vel = 0.29	
H.22 to H.20	123 123		0.53	0.862			12.000	0.0003	0.004		Vel = 0.29	
H.20 to H.16	123 123		0.0	1	Utr	2.0	13.000 2.000 15.000	150	20.509 0.0 0.003		Vel = 0.29	
H.16 to T.44	123 123		0.53	0.862			14.000	0.0002	0.003		Vel = 0.29	
T.44			0.0 0.53				2.000 2.000 4.000	150	20.516 0.0 0.002		Vel = 0.29	
T.44									20.518		K Factor = 0.12	
*New Path												
T.67 to T.68	110 110		1.27	0.75			7.000	150	26.757 0.0		Vel = 0.93	
T.68 to H.30	110 110		1.27	0.745			7.000	0.0027	0.019		Vel = 0.93	
H.30 to H.31	110 110		0.0	0.75	Ec	1.0	1.000 1.000 2.000	150	26.776 0.0 0.006		Vel = 0.93	
H.31 to H.31	110 110		1.27	0.745	Tcs	0.5	14.000 0.500 14.500	150	26.782 0.0 0.040		Vel = 0.93	
H.31 to T.69	110 110		0.0	0.75	Ec	1.0	2.000 1.000 3.000	150	26.822 0.0 0.008		Vel = 0.93	
T.69 to T.62	110 110		1.27	0.745			12.000	150	26.830 0.0 0.034		Vel = 0.93	
T.62 to T.58	110 110		0.53	0.75	Tcs	0.5	13.000 0.500 13.500	150	26.864 0.0 0.071		Vel = 1.32	
T.58 to T.55	110 110		-1.03	0.75	Tcs Ec	0.5 1.0	9.000 1.500 10.500	150	26.935 0.0 0.012		Vel = 0.57	

Final Calculations : Hazen-Williams

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
T.55 to H.24	110 110		0.0 0.77	0.75 0.745	Tcs	0.5	2.000 0.500 2.500	150 0.0008	26.947 0.0 0.002		Vel = 0.57	
H.24 to H.23	110 110		0.0 0.77	0.75 0.745			14.000 14.000	150 0.0011	26.949 0.0 0.016		Vel = 0.57	
H.23 to T.54	110 110		0.0 0.77	0.75 0.745	Tcs	0.5	1.000 0.500 1.500	150 0.0007	26.965 0.0 0.001		Vel = 0.57	
T.54 to T.57	110 110		0.0 0.77	0.75 0.745	Tcs Ec	0.5 1.0	9.000 1.500 10.500	150 0.0011	26.966 0.0 0.012		Vel = 0.57	
T.57 to T.60	110 110		1.03 1.8	0.75 0.745	Tc	2.0	3.000 2.000 5.000	150 0.0052	26.978 0.0 0.026		Vel = 1.32	
T.60			0.0 1.80						27.004		K Factor = 0.35	
*New Path												
T.63 to T.64	110 110		0.53 0.53	0.75 0.745	Tc	2.0	1.000 2.000 3.000	150 0.0003	26.848 0.0 0.001		Vel = 0.39	
T.64 to T.65	110 110		0.0 0.53	0.75 0.745	Ec	1.0	1.000 1.000 2.000	150 0.0005	26.849 0.0 0.001		Vel = 0.39	
T.65 to H.29	110 110		0.0 0.53	0.75 0.745	Ec	1.0	4.000 1.000 5.000	150 0.0006	26.850 0.0 0.003		Vel = 0.39	
H.29 to T.66	110 110		0.0 0.53	0.75 0.745	Ec Tcs	1.0 0.5	1.000 1.500 2.500	150 0.0008	26.853 0.0 0.002		Vel = 0.39	
T.66 to T.61	110 110		0.0 0.53	0.75 0.745			1.000 1.000	150 0	26.855 0.0 0.0		Vel = 0.39	
T.61 to H.28	110 110		0.0 0.53	0.75 0.745	Ec	1.0	10.000 1.000 11.000	150 0.0005	26.855 0.0 0.006		Vel = 0.39	
H.28 to T.62	110 110		0.0 0.53	0.75 0.745	Tc Tcs	2.0 0.5	2.000 2.500 4.500	150 0.0007	26.861 0.0 0.003		Vel = 0.39	
T.62			0.0 0.53						26.864		K Factor = 0.10	
*New Path												
T.58 to H.26	110 110		1.03 1.03	0.75 0.745	Tc Tcs	2.0 0.5	2.000 2.500 4.500	150 0.0018	26.935 0.0 0.008		Vel = 0.76	
H.26 to H.25	110 110		0.0 1.03	0.75 0.745			10.000 10.000	150 0.0019	26.943 0.0 0.019		Vel = 0.76	

Final Calculations : Hazen-Williams

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NLV DEVELOPMENT - UNIT E1.1 - One Head Calculation (H.1)

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
H.25 to T.57	110 110		0.0 1.03	0.75 0.745	Tc Tcs 2.0 0.5	6.000 2.500 8.500	150	26.962 0.0			
			0.0 1.03					0.016	Vel =	0.76	
T.57								26.978	K Factor =	0.20	

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am NICET Certified.



Tim W McDonald Date: 09/21/2023

NICET Certification No. 150393
Water-Based Systems Layout - Level III
Certification Expires: June 1, 2025

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AquaSAFE™ Fire Safety System

Uponor
5925 148th Street West
Apple Valley, MN 55124
800-321-4739

Job Name : NLV DEVELOPMENT - UNIT E1.1 - Two Head Calculation (H.11 & H.9)
Drawing : RESIDENTIAL
Location : LONGVIEW & KESSLER LEES SUMMIT MO 6481
Remote Area : 1
Contract : 44424F 003
Data File : 44424F 003 NLV Development - Longview & Kessler - Fire, Unit
Date/Time : 09/21/2023 - 06:04 AM

HYDRAULIC DESIGN INFORMATION SHEET

Name - NLV DEVELOPMENT - UNIT E1.1 Date - 08/12/2023
Location - LEES SUMMIT MO 6481
Building - RESIDENTIAL System No. - 1
Contractor - S & B PLUMBING INC. Contract No. - 44424F 003
Calculated By - TIM McDONALD Drawing No. - F100
Construction: (X) Combustible () Non-Combustible Ceiling Height VARIES
OCCUPANCY - RESIDENTIAL

S Type of Calculation: () NFPA 13 Residential () NFPA 13R (X) NFPA 13D
Y Number of Sprinklers Flowing: () 1 (X) 2 () 4 ()
S () Other
T () Specific Ruling Made by Date
E
M Listed Flow at Start Point - 10 Gpm System Type
Listed Pres. at Start Point - 7.3 Psi (X) Wet () Dry
D MAXIMUM LISTED SPACING 14 x 14 () Deluge () PreAction
E Domestic Flow Added - 0 Gpm Sprinkler or Nozzle
S Additional Flow Added - Gpm Make SENJU Model RC-RESLF37
I Elevation at Highest Outlet - 135 Feet Size 7/16 K-Factor 3.7
G Note: Temperature Rating 162
N

Calculation Gpm Required 19.9956 Psi Required 72.75 At Ref Pt STR
Summary C-Factor Used: Overhead 150 Underground 150

W Water Flow Test: Pump Data: Tank or Reservoir:
A Date of Test - x Rated Cap. Cap.
T Time of Test - x @ Psi Elev.
E Static (Psi) - 88 Elev.
R Residual (Psi) - 84 Other Well
Flow (Gpm) - 1443 Proof Flow Gpm
S Elevation - 95
P Location: STREET
P
L Source of Information: CONTRACTOR
Y

Water Supply Curve

Uponor
NLV DEVELOPMENT - UNIT E1.1 - Two Head Calculation (H.11 & H.9)

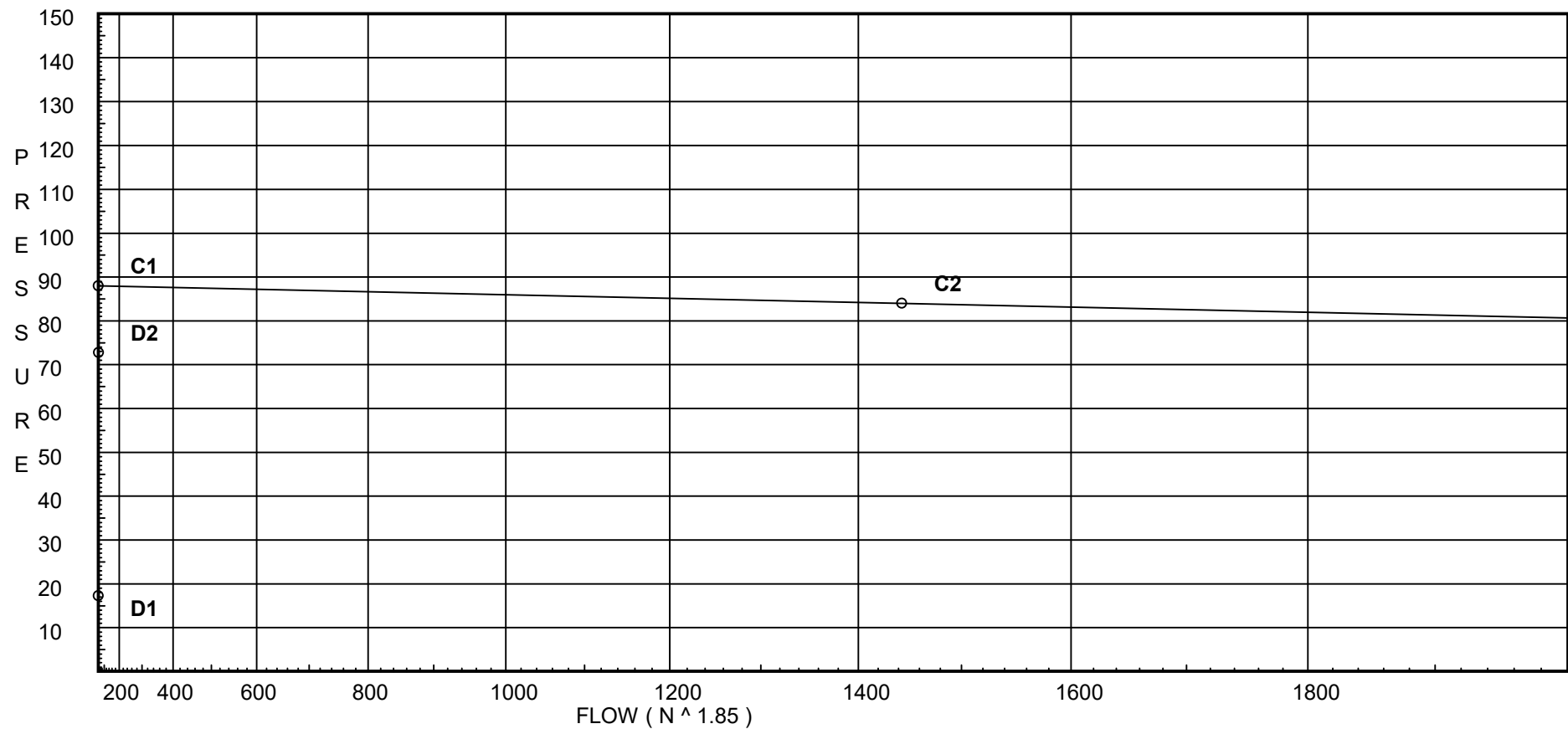
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City Water Supply:

C1 - Static Pressure : 88
C2 - Residual Pressure: 84
C2 - Residual Flow : 1443

Demand:

D1 - Elevation : 17.324
D2 - System Flow : 19.996
D2 - System Pressure : 72.752
Hose (Demand) :
D3 - System Demand : 19.996
Safety Margin : 15.247



Fittings Used Summary

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NLV DEVELOPMENT - UNIT E1.1 - Two Head Calculation (H.11 & H.9)

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Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
Ec *	Copper 90' Ell	1	1	2	2	2.5	3.5	4	5	6	7	9	10	0	0	0	0	0	0	0	0
T	NFPA 13 90' Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121
Tc *	Copper Tee-Branch	1.5	2	2	3	3.5	5	6	7.5	9	10.5	13	15	0	0	0	0	0	0	0	0
Tcs *	Copper Cplg/Tee-Run	0.5	0.5	0.5	1	1	1	1.5	1.5	2	2	2.5	3	0	0	0	0	0	0	0	0
Uel *	Aquapex 90 Elbow	11	11	12	11	13	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utb *	Aquapex Tee - Branch	2	17	14	9	12	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utr *	Aquapex Tee - Run	1	2	2	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Units Summary

Diameter Units Inches
Length Units Feet
Flow Units US Gallons per Minute
Pressure Units Pounds per Square Inch

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.

Flow Summary - NFPA

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SUPPLY ANALYSIS

<i>Node at Source</i>	<i>Static Pressure</i>	<i>Residual Pressure</i>	<i>Flow</i>	<i>Available Pressure</i>	<i>Total Demand</i>	<i>Required Pressure</i>
STR	88.0	84	1443.0	87.999	20.0	72.752

NODE ANALYSIS

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>	
H.11	135.0	3.7	7.3	10.0	0.05	196
T.40	135.0		8.1			
T.53	123.0		14.22			
T.52	123.0		14.27			
T.67	110.0		21.16			
T.63	110.0		21.35			
H.27	110.0		21.59			
T.60	110.0		21.67			
T.59	110.0		21.69			
S.1	108.0		23.02			
PRV	95.0	3.7	34.13			
UG	95.0		43.92			
MTR	95.0		66.19			
STR	95.0		72.75			
H.9	135.0		7.3	10.0	0.05	196
T.39	135.0		7.77			
T.38	135.0		8.04			
T.34	135.0		8.31			
H.5	135.0		8.4			
T.33	135.0		8.52			
T.44	123.0		14.3			
H.13	123.0		14.68			
H.12	123.0		15.04			
T.42	123.0		15.46			
T.41	123.0		15.49			
T.56	110.0		21.48			
H.8	135.0		8.28			
T.37	135.0		8.34			
T.51	123.0		14.22			
T.50	123.0		14.29			
T.49	123.0		14.3			
T.48	123.0		14.36			
T.46	123.0		14.41			
H.17	123.0		14.43			
T.47	123.0		14.49			
T.45	123.0		14.55			
H.15	123.0		14.57			
T.43	123.0		14.64			
H.14	123.0		14.75			
H.10	135.0		8.14			
T.36	135.0		8.32			
H.1	135.0		8.52			

Flow Summary - NFPA

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NLV DEVELOPMENT - UNIT E1.1 - Two Head Calculation (H.11 & H.9)

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NODE ANALYSIS (cont.)

Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node	Notes
T.32	135.0		8.61		
H.6	135.0		8.32		
T.35	135.0		8.33		
H.7	135.0		8.33		
H.2	135.0		8.55		
H.3	135.0		8.58		
H.4	135.0		8.6		
H.19	123.0		14.24		
H.21	123.0		14.23		
H.22	123.0		14.25		
H.20	123.0		14.27		
H.16	123.0		14.29		
H.18	123.0		14.3		
T.68	110.0		21.2		
H.30	110.0		21.21		
H.31	110.0		21.29		
T.69	110.0		21.31		
T.62	110.0		21.38		
T.58	110.0		21.53		
T.55	110.0		21.55		
H.24	110.0		21.56		
H.23	110.0		21.59		
T.54	110.0		21.6		
T.57	110.0		21.62		
T.64	110.0		21.35		
T.65	110.0		21.35		
H.29	110.0		21.36		
T.66	110.0		21.36		
T.61	110.0		21.36		
H.28	110.0		21.38		
H.26	110.0		21.55		
H.25	110.0		21.59		

Final Calculations : Hazen-Williams

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NLV DEVELOPMENT - UNIT E1.1 - Two Head Calculation (H.11 & H.9)

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
*Remote Head to Supply												
H.11 to T.40	135 135	3.70	9.57	1	Utr	2.0	12.000 2.000 14.000	150	7.300 0.0			
T.40 to T.53	135 123		9.57 -3.94	0.862 1			15.000 28.000 43.000	0.0573 150	0.802 8.102 5.197	Vel =	5.26	
T.53 to T.52	123 123		5.63 -1.30	0.862 1	Utr	2.0	2.000 2.000 4.000	150	14.222 0.0			
T.52 to T.67	123 110		4.33 2.51	0.862 0.75	2Tc	4.0	16.000 4.000 20.000	0.0130 150	0.052 14.274 5.630	Vel =	2.38	
T.67 to T.63	110 110		6.84 -1.88	0.745 0.75	Tcs	0.5	5.000 0.500 5.500	0.0627 150	1.254 21.158 0.0	Vel =	5.03	
T.63 to H.27	110 110		4.96 -0.79	0.745 0.75	Tcs	0.5	9.000 0.500 9.500	0.0345 150	0.190 21.348 0.0	Vel =	3.65	
H.27 to T.60	110 110		4.17 0.0	0.745 0.75	Tc Tcs	2.0 0.5	1.000 2.500 3.500	0.0251 150	0.238 21.586 0.0	Vel =	3.07	
T.60 to T.59	110 110		4.17 2.67	0.745 1.25	Tcs	1.0	2.000 1.000 3.000	0.0251 150	0.088 21.674 0.0	Vel =	3.07	
T.59 to S.1	110 108		6.84 13.16	1.245 1.25	T	5.492	7.000 5.492 12.492	0.0053 150	0.016 21.690 0.866	Vel =	1.80	
S.1 to PRV	108 95		20.0 0.0	1.245 1.25	E	2.746	10.000 2.746 12.746	0.0374 150	0.467 23.023 10.630	Vel =	5.27	** Fixed Loss = 5
PRV to UG	95 95		20.0 0.0	1.245 0.75	E	1.414	15.000 1.414 16.414	0.0373 150	0.476 34.129 0.0	Vel =	5.27	
UG to MTR	95 95		20.0 0.0	0.705 0.75			16.414 5.000 5.000	0.5963 150	9.787 43.916 20.000	Vel =	16.44	** Fixed Loss = 20
MTR to STR	95 95		20.0 0.0	0.745 0.75			5.000 10.000 10.000	0.4556 150	2.278 66.194 2.000	Vel =	14.72	** Fixed Loss = 2
STR			0.0 20.00						4.558 72.752			K Factor = 2.34
*New Path												
H.11 to H.9	135 135		0.43	1			15.000	150	7.300 0.0			
H.9 to T.39	135 135	3.70	0.43 10.00	0.862 1	Utr	2.0	15.000 2.000 7.000	0.0002 150	0.003 7.303 0.0	Vel =	0.24	
T.39	135		10.43	0.862				0.0671	0.470	Vel =	5.73	

Final Calculations : Hazen-Williams

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NLV DEVELOPMENT - UNIT E1.1 - Two Head Calculation (H.11 & H.9)

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
T.39 to T.38	135 135		0.0 10.43	1 0.862	Utr	2.0	2.000 2.000 4.000	150 0.0672	7.773 0.0 0.269		Vel = 5.73	
T.38 to T.34	135 135		-3.75 6.68	1 0.862	Utr	2.0	7.000 2.000 9.000	150 0.0294	8.042 0.0 0.265		Vel = 3.67	
T.34 to H.5	135 135		-0.68 6.0	1 0.862	Utr	2.0	2.000 2.000 4.000	150 0.0242	8.307 0.0 0.097		Vel = 3.30	
H.5 to T.33	135 135		0.0 6.0	1 0.862	Utr	2.0	3.000 2.000 5.000	150 0.0242	8.404 0.0 0.121		Vel = 3.30	
T.33 to T.44	135 123		-1.73 4.27	1 0.862	2Utb	34.0	16.646 28.000 44.646	150 0.0129	8.525 5.197 0.575		Vel = 2.35	
T.44 to H.13	123 123		1.30 5.57	1 0.862	Utr	2.0	16.000 2.000 18.000	150 0.0211	14.297 0.0 0.380		Vel = 3.06	
H.13 to H.12	123 123		0.0 5.57	1 0.862	Utr	2.0	15.000 2.000 17.000	150 0.0211	14.677 0.0 0.358		Vel = 3.06	
H.12 to T.42	123 123		0.0 5.57	1 0.862	Utb	17.0	6.000 14.000 20.000	150 0.0210	15.035 0.0 0.421		Vel = 3.06	
T.42 to T.41	123 123		7.58 13.15	1.25 1.245			2.000 2.000 2.000	150 0.0175	15.456 0.0 0.035		Vel = 3.47	
T.41 to T.56	123 110		0.0 13.15	1.25 1.245	Ec	2.0	19.000 2.000 21.000	150 0.0172	15.491 5.630 0.362		Vel = 3.47	
T.56 to T.59	110 110		0.0 13.15	1.25 1.245	Tc Ec	3.0 2.0	7.000 5.000 12.000	150 0.0172	21.483 0.0 0.207		Vel = 3.47	
T.59			0.0 13.15						21.690		K Factor = 2.82	
*New Path												
T.38 to H.8	135 135		3.74 3.74	1 0.862	Utb	17.0	10.000 14.000 24.000	150 0.0101	8.042 0.0 0.242		Vel = 2.06	
H.8 to T.37	135 135		0.0 3.74	1 0.862	Utr	2.0	3.000 2.000 5.000	150 0.0102	8.284 0.0 0.051		Vel = 2.06	
T.37 to T.51	135 123		1.11 4.85	1 0.862	2Utb	34.0	14.000 28.000 42.000	150 0.0163	8.335 5.197 0.684		Vel = 2.67	
T.51 to T.50	123 123		-2.52 2.33	1 0.862	Utr	2.0	15.000 2.000 17.000	150 0.0042	14.216 0.0 0.072		Vel = 1.28	

Final Calculations : Hazen-Williams

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
T.50 to T.49	123 123		-0.29 2.04	1 0.862	Utr	2.0 2.000 4.000	150 0.0032	14.288 0.0 0.013		Vel = 1.12	
T.49 to T.48	123 123		0.29 2.33	1 0.862	Uel	11.0 1.000 12.000 13.000	150 0.0042	14.301 0.0 0.055		Vel = 1.28	
T.48 to T.46	123 123		0.0 2.33	1 0.862	Uel	11.0 2.000 12.000 14.000	150 0.0041	14.356 0.0 0.058		Vel = 1.28	
T.46 to H.17	123 123		0.0 2.33	1 0.862	Utr	2.0 1.000 2.000 3.000	150 0.0043	14.414 0.0 0.013		Vel = 1.28	
H.17 to T.47	123 123		0.0 2.33	1 0.862	Uel	11.0 4.000 12.000 16.000	150 0.0042	14.427 0.0 0.067		Vel = 1.28	
T.47 to T.45	123 123		0.0 2.33	1 0.862	Uel	11.0 2.000 12.000 14.000	150 0.0042	14.494 0.0 0.059		Vel = 1.28	
T.45 to H.15	123 123		0.0 2.33	1 0.862		5.000 5.000	150 0.0042	14.553 0.0 0.021		Vel = 1.28	
H.15 to T.43	123 123		0.0 2.33	1 0.862	Utr	2.0 13.000 2.000 15.000	150 0.0043	14.574 0.0 0.064		Vel = 1.28	
T.43 to H.14	123 123		5.25 7.58	1 0.862	Utr	2.0 1.000 2.000 3.000	150 0.0370	14.638 0.0 0.111		Vel = 4.17	
H.14 to T.42	123 123		0.0 7.58	1 0.862	Utb Utr	17.0 3.000 16.000 19.000	150 0.0372	14.749 0.0 0.707		Vel = 4.17	
T.42			0.0 7.58					15.456		K Factor = 1.93	
*New Path											
T.40 to H.10	135 135		3.94 3.94	1 0.862	Utr	2.0 1.000 2.000 3.000	150 0.0110	8.102 0.0 0.033		Vel = 2.17	
H.10 to T.36	135 135		0.0 3.94	1 0.862	Utr	2.0 15.000 2.000 17.000	150 0.0111	8.135 0.0 0.188		Vel = 2.17	
T.36 to H.1	135 135		-0.42 3.52	1 0.862	Utr	2.0 20.000 2.000 22.000	150 0.0090	8.323 0.0 0.198		Vel = 1.94	
H.1 to T.32	135 135		0.0 3.52	1 0.862	Utr	2.0 8.000 2.000 10.000	150 0.0090	8.521 0.0 0.090		Vel = 1.94	
T.32 to T.43	135 123		1.73 5.25	1 0.862	2Utb	34.0 16.000 28.000 44.000	150 0.0189	8.611 5.197 0.830		Vel = 2.89	

Final Calculations : Hazen-Williams

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NLV DEVELOPMENT - UNIT E1.1 - Two Head Calculation (H.11 & H.9)

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
T.43			0.0 5.25						14.638		K Factor = 1.37	
*New Path												
T.34 to H.6	135 135		0.69	1	Utb Utr	17.0 2.0	9.000 16.000 25.000	150	8.307 0.0			
H.6 to T.35	135 135		0.69	0.862			25.000	0.0004	0.011	Vel =	0.38	
H.6 to T.35	135 135		0.0	1	Utb	17.0	7.000 14.000	150	8.318 0.0			
T.35 to T.37	135 135		0.69	0.862			21.000	0.0004	0.009	Vel =	0.38	
T.35 to T.37	135 135		0.41	1	Utr	2.0	5.000 2.000	150	8.327 0.0			
T.37			1.1	0.862			7.000	0.0011	0.008	Vel =	0.60	
T.37			0.0 1.10						8.335		K Factor = 0.38	
*New Path												
T.36 to H.7	135 135		0.42	1	Utb	17.0	4.000 14.000	150	8.323 0.0			
H.7 to T.35	135 135		0.42	0.862			18.000	0.0002	0.003	Vel =	0.23	
H.7 to T.35	135 135		0.0	1	Utr	2.0	4.000 2.000	150	8.326 0.0			
T.35			0.42	0.862			6.000	0.0002	0.001	Vel =	0.23	
T.35			0.0 0.42						8.327		K Factor = 0.15	
*New Path												
T.33 to H.2	135 135		1.73	1	Utr	2.0	9.000 2.000	150	8.525 0.0			
H.2 to H.3	135 135		1.73	0.862			11.000	0.0024	0.026	Vel =	0.95	
H.2 to H.3	135 135		0.0	1	Utr	2.0	10.000 2.000	150	8.551 0.0			
H.3 to H.4	135 135		1.73	0.862			12.000	0.0024	0.029	Vel =	0.95	
H.3 to H.4	135 135		0.0	1			7.000	150	8.580 0.0			
H.4 to T.32	135 135		1.73	0.862			7.000	0.0024	0.017	Vel =	0.95	
H.4 to T.32	135 135		0.0	1	Utr	2.0	4.000 2.000	150	8.597 0.0			
T.32			1.73	0.862			6.000	0.0023	0.014	Vel =	0.95	
T.32			0.0 1.73						8.611		K Factor = 0.59	
*New Path												
T.51 to H.19	123 123		2.52	1	Utr	2.0	3.000 2.000	150	14.216 0.0			
H.19 to T.52	123 123		2.52	0.862			5.000	0.0048	0.024	Vel =	1.39	
H.19 to T.52	123 123		0.0	1	Utr	2.0	5.000 2.000	150	14.240 0.0			
T.52			2.52	0.862			7.000	0.0049	0.034	Vel =	1.39	
T.52			0.0 2.52						14.274		K Factor = 0.67	

Final Calculations : Hazen-Williams

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
*New Path												
T.53 to H.21	123 123		1.30 1.3	1 0.862	Utr	2.0	6.000 2.000 8.000	150 0.0014	14.222 0.0 0.011		Vel = 0.71	
H.21 to H.22	123 123		0.0 1.3	1 0.862			12.000 12.000	150 0.0014	14.233 0.0 0.017		Vel = 0.71	
H.22 to H.20	123 123		0.0 1.3	1 0.862	Utr	2.0	13.000 2.000 15.000	150 0.0015	14.250 0.0 0.022		Vel = 0.71	
H.20 to H.16	123 123		0.0 1.3	1 0.862	Utr	2.0	12.000 2.000 14.000	150 0.0014	14.272 0.0 0.020		Vel = 0.71	
H.16 to T.44	123 123		0.0 1.3	1 0.862	Utr	2.0	2.000 2.000 4.000	150 0.0012	14.292 0.0 0.005		Vel = 0.71	
T.44			0.0 1.30						14.297		K Factor = 0.34	
*New Path												
T.50 to H.18	123 123		0.30 0.3	0.75 0.671	Utb Utr	17.0 2.0	3.000 19.000 22.000	150 0.0003	14.288 0.0 0.007		Vel = 0.27	
H.18 to T.49	123 123		0.0 0.3	0.75 0.671	Utb	17.0	3.000 17.000 20.000	150 0.0003	14.295 0.0 0.006		Vel = 0.27	
T.49			0.0 0.30						14.301		K Factor = 0.08	
*New Path												
T.67 to T.68	110 110		1.89 1.89	0.75 0.745			7.000 7.000	150 0.0059	21.158 0.0 0.041		Vel = 1.39	
T.68 to H.30	110 110		0.0 1.89	0.75 0.745	Ec	1.0	1.000 1.000 2.000	150 0.0055	21.199 0.0 0.011		Vel = 1.39	
H.30 to H.31	110 110		0.0 1.89	0.75 0.745	Tcs	0.5	14.000 0.500 14.500	150 0.0058	21.210 0.0 0.084		Vel = 1.39	
H.31 to T.69	110 110		0.0 1.89	0.75 0.745	Ec	1.0	2.000 1.000 3.000	150 0.0060	21.294 0.0 0.018		Vel = 1.39	
T.69 to T.62	110 110		0.0 1.89	0.75 0.745			12.000 12.000	150 0.0058	21.312 0.0 0.069		Vel = 1.39	
T.62 to T.58	110 110		0.78 2.67	0.75 0.745	Tcs	0.5	13.000 0.500 13.500	150 0.0110	21.381 0.0 0.148		Vel = 1.97	
T.58 to T.55	110 110		-1.52 1.15	0.75 0.745	Tcs Ec	0.5 1.0	9.000 1.500 10.500	150 0.0024	21.529 0.0 0.025		Vel = 0.85	

Final Calculations : Hazen-Williams

Uponor
NLV DEVELOPMENT - UNIT E1.1 - Two Head Calculation (H.11 & H.9)

Page 11
Date 9/21/2023

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
T.55 to H.24	110 110		0.0 1.15	0.75 0.745	Tcs	0.5	2.000 0.500 2.500	150 0.0020	21.554 0.0 0.005		Vel = 0.85	
H.24 to H.23	110 110		0.0 1.15	0.75 0.745			14.000 14.000	150 0.0024	21.559 0.0 0.033		Vel = 0.85	
H.23 to T.54	110 110		0.0 1.15	0.75 0.745	Tcs	0.5	1.000 0.500 1.500	150 0.0020	21.592 0.0 0.003		Vel = 0.85	
T.54 to T.57	110 110		0.0 1.15	0.75 0.745	Tcs Ec	0.5 1.0	9.000 1.500 10.500	150 0.0023	21.595 0.0 0.024		Vel = 0.85	
T.57 to T.60	110 110		1.52 2.67	0.75 0.745	Tc	2.0	3.000 2.000 5.000	150 0.0110	21.619 0.0 0.055		Vel = 1.97	
T.60			0.0 2.67						21.674		K Factor = 0.57	
*New Path												
T.63 to T.64	110 110		0.78 0.78	0.75 0.745	Tc	2.0	1.000 2.000 3.000	150 0.0010	21.348 0.0 0.003		Vel = 0.57	
T.64 to T.65	110 110		0.0 0.78	0.75 0.745	Ec	1.0	1.000 1.000 2.000	150 0.0015	21.351 0.0 0.003		Vel = 0.57	
T.65 to H.29	110 110		0.0 0.78	0.75 0.745	Ec	1.0	4.000 1.000 5.000	150 0.0010	21.354 0.0 0.005		Vel = 0.57	
H.29 to T.66	110 110		0.0 0.78	0.75 0.745	Ec Tcs	1.0 0.5	1.000 1.500 2.500	150 0.0012	21.359 0.0 0.003		Vel = 0.57	
T.66 to T.61	110 110		0.0 0.78	0.75 0.745			1.000 1.000	150 0.0010	21.362 0.0 0.001		Vel = 0.57	
T.61 to H.28	110 110		0.0 0.78	0.75 0.745	Ec	1.0	10.000 1.000 11.000	150 0.0012	21.363 0.0 0.013		Vel = 0.57	
H.28 to T.62	110 110		0.0 0.78	0.75 0.745	Tc Tcs	2.0 0.5	2.000 2.500 4.500	150 0.0011	21.376 0.0 0.005		Vel = 0.57	
T.62			0.0 0.78						21.381		K Factor = 0.17	
*New Path												
T.58 to H.26	110 110		1.52 1.52	0.75 0.745	Tc Tcs	2.0 0.5	2.000 2.500 4.500	150 0.0040	21.529 0.0 0.018		Vel = 1.12	
H.26 to H.25	110 110		0.0 1.52	0.75 0.745			10.000 10.000	150 0.0039	21.547 0.0 0.039		Vel = 1.12	

Final Calculations : Hazen-Williams

Uponor
NLV DEVELOPMENT - UNIT E1.1 - Two Head Calculation (H.11 & H.9)

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Date 9/21/2023

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
H.25 to T.57	110 110		0.0 1.52	0.75 0.745	Tc Tcs 2.0 0.5	6.000 2.500 8.500	150 0.0039	21.586 0.0 0.033		Vel = 1.12	
T.57			0.0 1.52					21.619		K Factor = 0.33	

DESIGN SERVICES
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SPRINKLER SYMBOL DEFINITION

XXX-XX

MAXIMUM SPACING (TYP)

SPRINKLER MODEL (TYP)

HEAD SYMBOL (TYP)

COLOR/LINETYPE LEGEND

BLUE LINES= FEED TO FIXTURES (BATH, SHOWER, ETC.).

GREEN LINES= INTERLEVEL CONNECTIONS/SUPPLY.

BLACK LINES= SPRINKLER HEAD TO SPRINKLER HEAD.

— = 1/2" PIPE SIZE

— = 3/4" PIPE SIZE

— = 1" PIPE SIZE

— = 1-1/4" PIPE SIZE

Johnson

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DISCIPLINAR

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I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am NICET Certified.

Tim M. Ward

Tim W McDonald Date: 09/21/2023
NICET Certification No. 150393
Water-Based Systems Layout - Level III
Certification Expires: June 1, 2025

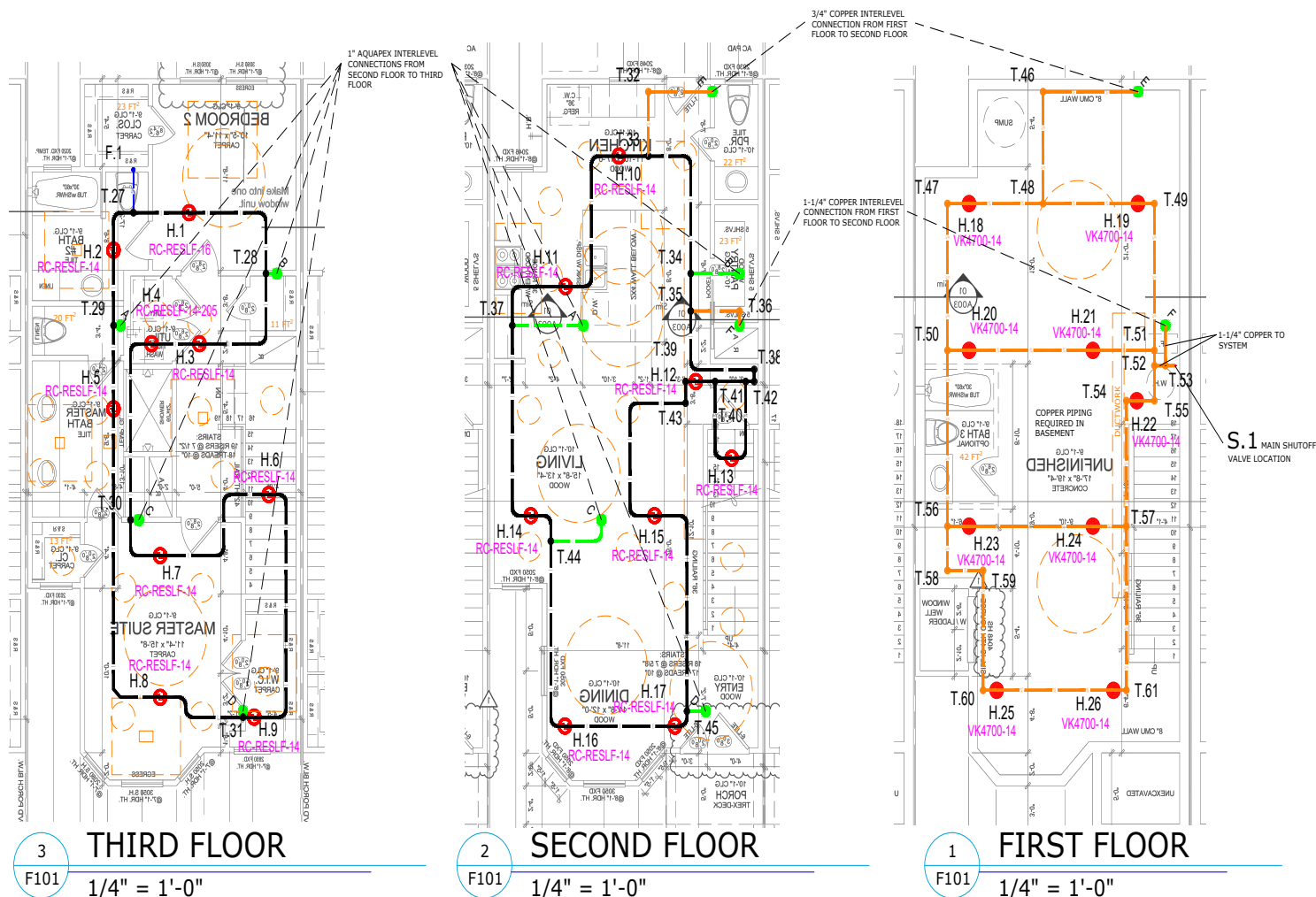
PROJECT NUMBER:	44424E 004	COMPANY:	S & B PLUMBING INC.
DRAWN BY:	TRIM McDONALD	CONTACT:	MIKE STOREY
CHECKED BY:	BRIAN KOTJALA	CONTACT PH. NUMBER:	913.681.5075
DATE:	08/12/2023	PROJECT ID:	08/12/2023
COORDINATOR:	113889	PLOT DATE:	08/12/2023
SQUARE FEET:	2144 SQ. FT.	SHEET SCALE:	1/4" = 1'-0"
REVISIONS			
NO.	DATE	DESCRIPTION	

NLV DEVELOPMENT - UNIT F1.1
 LONGVIEW & KESSLER
 LEE'S SUMMIT, MO 6481

SHEET DESCRIPTION
ALL FLOORS - MIRROR

SHEET NUMBER

F101



5 0 5 15 © UPONOR - CONFIDENTIAL
1/4" = 1'-0"

1. THIS SYSTEM IS DESIGNED AS PER NFPA 13D 2019 EDITION AS A RESIDENTIAL MULTIPURPOSE SYSTEM SECTION 3.12.13.
2. UPONOR COMPANY RESERVES THE EXCLUSIVE RIGHTS TO ALL DETAILS AND DRAWINGS AS SHOWN ON THIS SHEET. THESE DETAILS AND DRAWINGS ARE PROPRIETARY INFORMATION OF UPONOR COMPANY AND UNAUTHORIZED USE MAY BE SUBJECT TO PROSECUTION TO THE FULL EXTENT OF THE LAW.
3. THE DESIGN OF THIS SYSTEM IS DICTATED BY SPECIFIC CEILING HEIGHTS AND ROOM SIZES. IT IS THE RESPONSIBILITY OF THE INSTALLING CONTRACTOR TO ENSURE THAT THE CONDITIONS SHOWN ON THESE PLANS ARE EXACTLY AS THEY EXIST IN THE FIELD. DEVIATIONS FROM THE DESIGN MAY CAUSE THE SYSTEM TO BE UNABLE TO CONTROL A FIRE. IF THE BUILDING CONSTRUCTION DIFFERS FROM THE FIRE SPRINKLER PLAN, CONTACT THE SYSTEM DESIGNER IMMEDIATELY.
4. THIS SYSTEM AND THE ACCOMPANYING HYDRAULIC CALCULATIONS ARE DESIGNED IN COMPLIANCE WITH NFPA 13D 2019 EDITION.
5. "STAND-ALONE" OR "MULTIPURPOSE, WET PIPE" SYSTEMS ARE PERMITTED TO ONLY USE ANTI-FREEZE LISTED FOR USE IN WET SPRINKLER SYSTEMS.
6. MODIFICATIONS ARE PROHIBITED. SPRINKLERS THAT HAVE BEEN PAINTED, CAULKED, MODIFIED OR DAMAGED MUST BE REPLACED.
7. A SINGLE CONTROL VALVE ARRANGED TO SHUT OFF BOTH THE DOMESTIC SYSTEM AND THE SPRINKLER SYSTEM SHALL BE INSTALLED.
8. OWNERS MANUAL MUST BE PROVIDED TO THE OWNER.

- AT THE MAIN SHUT OFF VALVE, A TAG OR A SIGN STATING THE FOLLOWING IS REQUIRED; "WARNING: THE WATER SYSTEM FOR THIS HOME SUPPLIES FIRE SPRINKLERS THAT REQUIRE CERTAIN FLOWS AND PRESSURES TO PROPERLY FIRE. DEVICES THAT RESTRICT THE FLOW OR DECREASE THE PRESSURE OR AUTOMATICALLY SHUT OFF THE WATER TO THE FIRE SPRINKLER SYSTEM, SUCH AS WATER STOPPERS, FILTRATION SYSTEMS AND AUTOMATIC SHUT OFF VALVES, **SHALL NOT** BE ADDED TO THIS SYSTEM WITHOUT REVIEW OF THE FIRE SPRINKLER SYSTEM BY A FIRE PROTECTION SPECIALIST. **DO NOT REMOVE THIS SIGN**"
10. ALL INTERIOR PIPING TO BE SUPPORTED "AQUAPEX®" UNLESS NOTED.
11. UPONOR "AQUAPEX" TUBING TO BE UPONOR PER NPA 130 AND MANUFACTURER'S RECOMMENDATIONS.
12. MINIMUM SPACING BETWEEN SPRINKLERS IS 8'-0" REFER TO SPACING CHARTS FOR MAXIMUM SPACING BETWEEN SPRINKLERS AND FROM WALLS. SPRINKLER HEAD MANUFACTURERS MAY HAVE MORE RESTRICTIVE SPACING LIMITATIONS.
13. SPRINKLERS ARE NOT NECESSARILY CANCELED IN ROOMS DUE TO LIGHT FIXTURES OR OTHER CEILING MOUNTED OBSTRUCTIONS.
14. THE PLUMBING TIE IN CONNECTIONS ARE SCHEMATIC IN NATURE AND CAN BE INSTALLED OFF THE SPRINKLER LOOP ANYWHERE BETWEEN SPRINKLER TO SPRINKLER CONNECTION.
15. THIS SUGGESTED LAYOUT IS BASED UPON INFORMATION PROVIDED BY OTHERS. CHANGES IN CONSTRUCTION OR FIELD CONDITIONS MAY OCCUR WHICH MAY REQUIRE CHANGES TO THE LAYOUT. IT IS THE RESPONSIBILITY OF THE INSTALLER TO NOTIFY UPONOR TECHNICAL SERVICES OF SUCH CHANGES.
16. NPA 130 8.2.5* OBSTRUCTIONS TO RESIDENTIAL SPRINKLERS
- a. 8.2.5.7* SHADOW AREAS SHALL BE PERMITTED IN THE PROTECTION AREA OF A SPRINKLER AS LONG AS THE SHADOW AREAS DO NOT EXCEED 15' FROM THE SPRINKLER.
 - b. 8.2.5.8 SMALL AREAS CREATED BY ARCHITECTURAL FEATURES, SUCH AS PLANTER BOX WINDOWS, BAY WINDOWS, AND SIMILAR FEATURES, SHALL BE EVALUATED AS FOLLOWS:
 - (1) WHERE NO ADDITIONAL FLOOR AREA IS CREATED BY THE ARCHITECTURAL FEATURE, NO ADDITIONAL SPRINKLER PROTECTION IS REQUIRED.
 - (2) WHERE ADDITIONAL FLOOR AREA IS CREATED BY AN ARCHITECTURAL FEATURE, NO ADDITIONAL SPRINKLER PROTECTION IS REQUIRED, PROVIDED ALL OF THE FOLLOWING CONDITIONS ARE MET:
 - a) THE FLOOR AREA SHALL NOT EXCEED 18' X 17' (1.7 M²)
 - b) THE FLOOR AREA SHALL NOT BE GREATER THAN 24 INCHES IN DEPTH AT THE DEEPEST POINT OF THE ARCHITECTURAL FEATURE TO THE PLANE OF THE PRIMARY WALL WHERE MEASURED ALONG THE FINISHED FLOOR.
 - c) THE FLOOR SHALL NOT BE GREATER THAN 9FT IN LENGTH WHERE MEASURED ALONG THE PLANE OF THE TRIMARY WALL.
 - d) MEASURED FROM THE DEEPEST POINT OF THE ARCHITECTURAL FEATURE TO THE SPRINKLER SHALL NOT EXCEED THE MAXIMUM LISTED SPACING OF THE SPRINKLER.
 - (3) THE HYDRAULIC DESIGN SHALL NOT BE REQUIRED TO CONSIDER THE AREA CREATED BY THE ARCHITECTURAL FEATURE.
17. NPA 130 8.3 LOCATION OF SPRINKLERS.
- a. 8.3.1 SPRINKLERS SHALL BE INSTALLED IN ALL AREAS EXCEPT WHERE OMISSION IS PERMITTED BY 8.3.1.3 THROUGH 8.3.8.
 - b. 8.3.2 SPRINKLERS SHALL NOT BE REQUIRED IN BATHROOMS OF 55 FT² (5.1 M²) AND LESS
 - c. 8.3.3 SPRINKLERS SHALL NOT BE REQUIRED IN CLOTHES CLOSETES, LINEN CLOSETES, AND PANTRIES THAT MEET ALL OF THE FOLLOWING CONDITIONS:
 - (1) THE AREA OF THE SPACE DOES NOT EXCEED 24' X 22' (2.2 M²).
 - (2) THE WALLS AND CEILINGS ARE SURFACED WITH NONCOMBUSTIBLE OR LIMITED-COMBUSTIBLE MATERIALS AS DEFINED IN NPA 220, STANDARD ON TYPES OF BUILDING CONSTRUCTION.
 - (3) SPRINKLERS SHALL NOT BE REQUIRED IN GARAGES, OPEN ATTACHED PORCHES, CARPORTS, AND SIMILAR STRUCTURES
 - d. 8.3.5 SPRINKLERS SHALL NOT BE REQUIRED IN ATTICS WITH OR WITHOUT STORAGE, PENTHOUSE ROOFS, ATTACHED GARAGES, BATHROOMS, CONCEALED SPACES DEDICATED EXCLUSIVELY TO AND CONTAINING ONLY DWELLING UNIT VENTILATION EQUIPMENT, FLOOR/CEILING SPLIT, ELEVATOR SHAFTS CRAW SPACES, AND OTHER CONCEALED SPACES THAT ARE NOT USED OR INTENDED FOR LIVING PURPOSES.
 - e. 8.3.6 IN SUCH SPACES THAT CONTAIN FUEL-FIRED EQUIPMENT SHALL ALSO COMPLY WITH 8.3.5.1.1 OR 8.3.5.1.2.
 - f. 8.3.5.1.1 WHERE THE FUEL-FIRED EQUIPMENT IS ABOVE ALL OF THE OCCUPIED AREAS OF THE DWELLING UNIT, NO SPRINKLER PROTECTION SHALL BE REQUIRED IN THE CONCEALED SPACE.
 - g. 8.3.5.1.2 WHERE THE FUEL-FIRED EQUIPMENT IS IN OR ON THE SAME LEVEL AS OCCUPIED AREAS OF THE DWELLING UNIT, AT LEAST ONE QUICKRESPONSE INTERMEDIATE TEMPERATURE SPRINKLER SHALL BE INSTALLED ABOVE THE EQUIPMENT OR AT THE WALL SEPARATING THE SPACE WITH THE FUEL-FIRED EQUIPMENT FROM THE OCCUPIED SPACE.
 - h. 8.3.6 SPRINKLERS SHALL NOT BE REQUIRED IN UNHEATED ENCLOSURES AT THE BUILDING AT ENTRANCES/EXITS AS LONG AS THE DWELLING UNIT HAS ANOTHER ENTRANCE/EXIT.
 - i. 8.3.7 SPRINKLERS SHALL NOT BE REQUIRED FOR CEILING POCKETS THAT MEET THE FOLLOWING CONDITIONS:
 - (1) THE TOTAL VOLUME OF ALL UNPROTECTED CEILING POCKETS IN A COMPARTMENT DOES NOT EXCEED 100 FT³ (2.83 M³).
 - (2) THE ENTIRE FLOOR UNDER THE UNPROTECTED CEILING POCKET IS PROTECTED BY THE SPRINKLERS IN THE LOWER CEILING SPACE.
 - (3) THE INTERIOR FINISH OF THE UNPROTECTED CEILING POCKET EXCLUDING DECORATIVE TREATMENTS IS NONCOMBUSTIBLE OR LIMITED-COMBUSTIBLE MATERIAL.
 - (4) SKYLIGHTS NOT EXCEEDING 32 FT² (2.97 M²) SHALL BE PERMITTED TO HAVE A PLASTIC COVER.
 - j. 8.3.8 SPRINKLERS SHALL NOT BE REQUIRED IN UNHEATED ATTIC OR GARAGES AND EXTERIOR CLOSETS (REGARDLESS OF SIZE) LOCATED ON EXTERIOR BALCONIES, EXTERIOR BREEZEWAYS/CORRIDORS, OR ACCESSSED FROM OUTDOORS WHERE THE CLOSET DOES NOT HAVE DOORS OR UNPROTECTED PENETRATIONS DIRECTLY INTO THE DWELLING UNIT.
 - k. 8.3.9 SPRINKLERS SHALL BE INSTALLED IN UNHEATED ATTIC USED FOR HEATING AND/OR AIR-CONDITIONING EQUIPMENT, WASHERS AND/OR DRYERS, OR WATER HEATERS EXCEPT AS ALLOWED BY 8.3.8.
18. INSULATION GUIDE LINES PER NPA 130.
- 9.1.1* WET PIPE SYSTEM
- a. 9.1.1.1 THE INSULATION SHALL BE PERMITTED TO BE TO BE USED WHERE ALL PIPING IS INSTALLED IN AREAS NOT SUBJECT TO FREEZING, INCLUDING AREAS PROPERLY INSULATED TO MAINTAIN 40°F.
 - b. A 1.5 IN AREAS SUBJECT TO FREEZING, CARE SHOULD BE TAKEN IN UNHEATED ATTIC SPACES TO COVER SPRINKLER PIPING COMPLETELY WITH INSULATION. INSTALLATION SHOULD FOLLOW THE GUIDELINES OF THE INSULATION MANUFACTURER. FIGURE A.9.1.1(A) THROUGH FIGURE A.9.1.1(F) SHOW SEVERAL METHODS THAT CAN BE CONSIDERED. THESE ARE FOR ILLUSTRATIVE PURPOSES ONLY AND NOT INTENDED TO BE A COMPLETE GUIDE. THE INSTALLER SHOULD BE ADVISED TO ENSURE PROPER METHODS AND MATERIALS ARE USED TO MAKE SURE 40°F WILL BE MAINTAINED.

Diagram illustrating the assembly of the Fire Sprinkler Adapter Mounting Bracket. The components and dimensions shown are:

- Sprinkler Adapter Tee
- Blocking Maybe Required. If Blocking is Used, Use The 2 Top Screw Holes.
- Fire Sprinkler Adapter Mounting Bracket
- 3 #10 x 1 1/2" Full Thread Screws In Bottom Holes
- Lead-Free Putty
- Concealed Senju Sprinkler Head
- Concealed Flat Cover Plate
- Fire Sprinkler Adapter Push-on Nut
- 1 3/4" Min.
- 1 1/2" Max.
- Bottom of Mounting Bracket to Face of Tee

Diagram illustrating the Fire Sprinkler Adapter Tee assembly. The assembly consists of the following components and dimensions:

- ProPEX LF Brass Fire Sprinkler Adapter Tee**: The main vertical component.
- Fire Sprinkler Adapter Push-on Nut**: Located at the top of the assembly.
- Fire Sprinkler Adapter Mounting Bracket**: A bracket that fits around the adapter tee.
- 2 #10 x 1 1/2" Full Course Thread Screws In Top Holes**: Screws used to secure the mounting bracket.
- Lead-Free Fire Concealed Seihju Sprinkler Head**: The sprinkler head assembly.
- Concealed Flat Cover Plate**: The plate that covers the bottom of the assembly.

Dimensions and Notes:

- 1 3/4" Min.**: Minimum dimension for the top section.
- 1 1/2" Max.**: Maximum dimension for the bottom section.
- Bottom of Mounting Bracket to Face of Tee**: Dimension indicating the distance from the bottom of the bracket to the face of the tee.

Diagram illustrating the installation of a Fire Sprinkler Adapter Tee. The assembly includes the ProPEX LF Brass Fire Sprinkler Adapter Tee, Fire Sprinkler Adapter Push-Nut, #10 x 1 1/2" Screws, Escutcheon, Recessed Pendant Sprinkler, and Fire Sprinkler Adapter Mounting Bracket. The diagram shows the adapter tee being mounted onto the fire sprinkler, secured with push-nut screws. A dimension of 1 1/2" is indicated for the height of the mounting bracket.

In areas subject to freezing, care should be taken in unheated attic spaces to cover Uponor AquaPEX tubing completely with insulation. Insulation should follow the guidelines of the insulation manufacturer. See Uponor Document **"Uponor AquaSAFE Attic Insulation Guidelines"** for attic installation guidelines (Provided in Contractors Documents package or online at www.Uponorpro.com).

AquaSAFE Residential Fire Safety systems are often installed in attics or other areas exposed to temperature extremes of heat and/or cold. Follow the recommended extreme weather installation instructions to isolate and protect system components from extreme temperatures. Because this system also delivers domestic cold water directly to plumbing fixtures, Uponor highly recommends that you protect the tubing with adequate insulation in warm weather areas to minimize heating of the cold water supply.

- Installation methods include, but are not limited to:
- Tenting over the fire sprinkler piping.
 - Additional layers of batt insulation.
 - Increased depth of blown-in insulation.

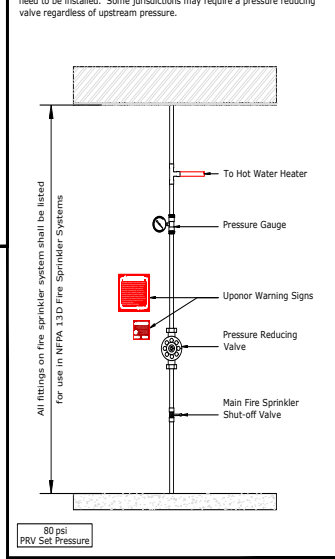
Caution: If you will be installing spray foam insulation, make sure to protect all components during application. Consult with the spray foam manufacturer to ensure compatibility with all products before application.

Consultation with local building officials is encouraged to ensure compliance with local building codes.

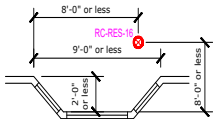
The minimum bend radius of Uponor PEX tubing in any direction is six times the outside diameter (**6 x OD**). Bend supports are available for 3/8", 1/2", 3/4" and 1" Uponor AquaPEX tubing to facilitate 90-degree rigid bends.

Fitting Size	Minimum Tubing Length
3/8" ProPEX Fitting	2"
1/2" ProPEX Fitting	2"
3/4" ProPEX Fitting	3"
1" ProPEX Fitting	3 1/2"
1 1/4" ProPEX Fitting	4 1/2"

If the upstream pressure exceeds 80 psi a pressure reducing valve may need to be installed. Some jurisdictions may require a pressure reducing valve regardless of upstream pressure.

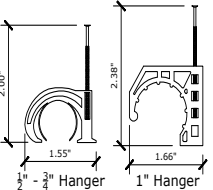


Planter Box Window, Bay Window or Similar Feature.
If no additional floor area is created **No Additional Sprinkler is Required.**



If additional floor area is created. Cannot exceed 18 ft², be more than 2'-0" deep, more than 9'-0" wide and be with in the coverage area of the sprinkler. **No Additional Sprinkler is Required.**

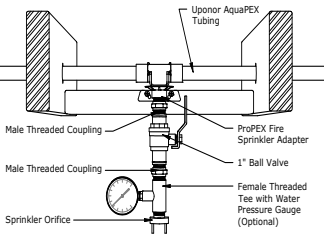
Heat Source	Ordinary Temp. 135°-170°	Intermediate Temp. 175°-225°
Side of Fireplace	36°	12°
Front of Fireplace	60°	36°
Wood Burning Stove	42°	12°
Kitchen Range	18°	9°
Wall Oven	18°	9°
Hot Air Pipes	18°	9°
Uninsulated Hot Ducts	18°	9°
Uninsulated Heat Water	12°	6°
Side of Hot Air Diffuser	24°	12°
Front of Hot Air Diffuser	36°	18°
Hot Water Heater	6°	3°
Furnace	6°	3°
50W-250W Light Fixture	6°	3°
250W-499W Light Fixture	12°	6°



(Anchor AquaPEX Tubing Securely Enough to Support the Tubing, Yet Relaxed Enough to Allow the Tubing to Expand and Contract)

1. Along Horizontal Runs, Install Supports Every 32", if Horizontal Runs are Continuously Supported, Place Tubing Supports at Six-Foot Intervals.
2. Along Vertical Runs, Install Supports Every Four to Five Feet, at Each Floor and at a Mid-story Guide.

The In-line Flow Test can be constructed on site. It performs a flow test to ensure proper system operation and flow (see **Figure F001-8**).



To ensure the system provides enough water for proper fire sprinkler performance, you should conduct a flow verification test.

Note: The NFPA 13D Installation Standard does not require flow verification.

Before performing a flow verification test, confirm the water pressures by contacting the Water and Sewer Department of your local city. Ensure the available water pressure matches the pressure used in the system design.

Note: The sprinkler plan indicates the most hydraulically remote sprinkler (or pair of sprinklers). For test requirements on other sprinklers, consult your local code.

Note: It is a good idea to notify the fire inspector at least 24 hours prior to performing a flow verification test. This may speed up the inspection process and eliminate the need to repeat the test for the inspector.

Note: See "AquaSAFE Flow Test Instruction Sheet" (Provided in Contractors Documents package or online at www.Uponorpro.com) for more information on Flow Test Setup, Assembly, Performing the Test and Troubleshooting. If there are any questions please contact Uponor.

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Tim W McDonald Date: 09/21/2023
NICET Certification No. 150393
Water-Based Systems Layout - Level III
Certification Expires: June 1, 2025

NLV DEVELOPMENT - UNIT F1.1
 LONGVIEW & KESSLER
 LEES SUMMIT, MO 6481

PROJECT NUMBER:	4442416 004	COMPANY:	S. B. B. BUILDING INC.
DRAWN BY:	THOMAS DONALD	CONTACT:	MIKE STORRY
CHECKED BY:	BRENT KOTULA	CONTACT PH. NUMBER:	913.681.5075
OPERATION SET	SET IV	AL. LICENSE ID:	3017
DATE	11/18/09	DATE OF SET	09/12/2010
SQUARE FEET	21,130 SQ. FT.	SHEET SCALE:	1/4" = 1'-0"
REVISIONS			
NO.	DATE	DESCRIPTION	

SHEET DESCRIPTION
GENERAL NOTES & DETAILS

SHEET NUMBER

F001

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am NICET Certified.



Tim W McDonald Date: 09/21/2023

NICET Certification No. 150393

Water-Based Systems Layout - Level III

Certification Expires: June 1, 2025

Uponor

AquaSAFE™ Fire Safety System

Uponor
5925 148th Street West
Apple Valley, MN 55124
800-321-4739

Job Name : NLV DEVELOPMENT - UNIT F1.1 - One Head Calculation (H.1)
Drawing : RESIDENTIAL
Location : LONGVIEW & KESSLER LEES SUMMIT MO 6481
Remote Area : 1
Contract : 44424F 004
Data File : 44424F 004 NLV Development - Longview & Kessler - Fire, Unit
Date/Time : 09/21/2023 - 06:12 AM

HYDRAULIC DESIGN INFORMATION SHEET

Name - NLV DEVELOPMENT - UNIT F1.1 Date - 08/12/2023
Location - LEES SUMMIT MO 6481
Building - RESIDENTIAL System No. - 1
Contractor - S & B PLUMBING INC. Contract No. - 44424F 004
Calculated By - TIM McDONALD Drawing No. - F100
Construction: (X) Combustible () Non-Combustible Ceiling Height VARIES
OCCUPANCY - RESIDENTIAL

S Type of Calculation: () NFPA 13 Residential () NFPA 13R (X) NFPA 13D
Y Number of Sprinklers Flowing: (X) 1 () 2 () 4 ()
S () Other
T () Specific Ruling Made by Date
E
M Listed Flow at Start Point - 14 Gpm System Type
Listed Pres. at Start Point - 14.3 Psi (X) Wet () Dry
D MAXIMUM LISTED SPACING 16 x 16 () Deluge () PreAction
E Domestic Flow Added - 0 Gpm Sprinkler or Nozzle
S Additional Flow Added - Gpm Make SENJU Model RC-RESLF37
I Elevation at Highest Outlet - 135 Feet Size 7/16 K-Factor 3.7
G Note: Temperature Rating 162
N

Calculation Gpm Required 14 Psi Required 69.95 At Ref Pt STR
Summary C-Factor Used: Overhead 150 Underground 150

W Water Flow Test: Pump Data: Tank or Reservoir:
A Date of Test - x Rated Cap. Cap.
T Time of Test - x @ Psi Elev.
E Static (Psi) - 88 Elev.
R Residual (Psi) - 84 Other Well
Flow (Gpm) - 1443 Proof Flow Gpm
S Elevation - 95
P Location: STREET
P
L Source of Information: CONTRACTOR
Y

Water Supply Curve

Uponor
NLV DEVELOPMENT - UNIT F1.1 - One Head Calculation (H.1)

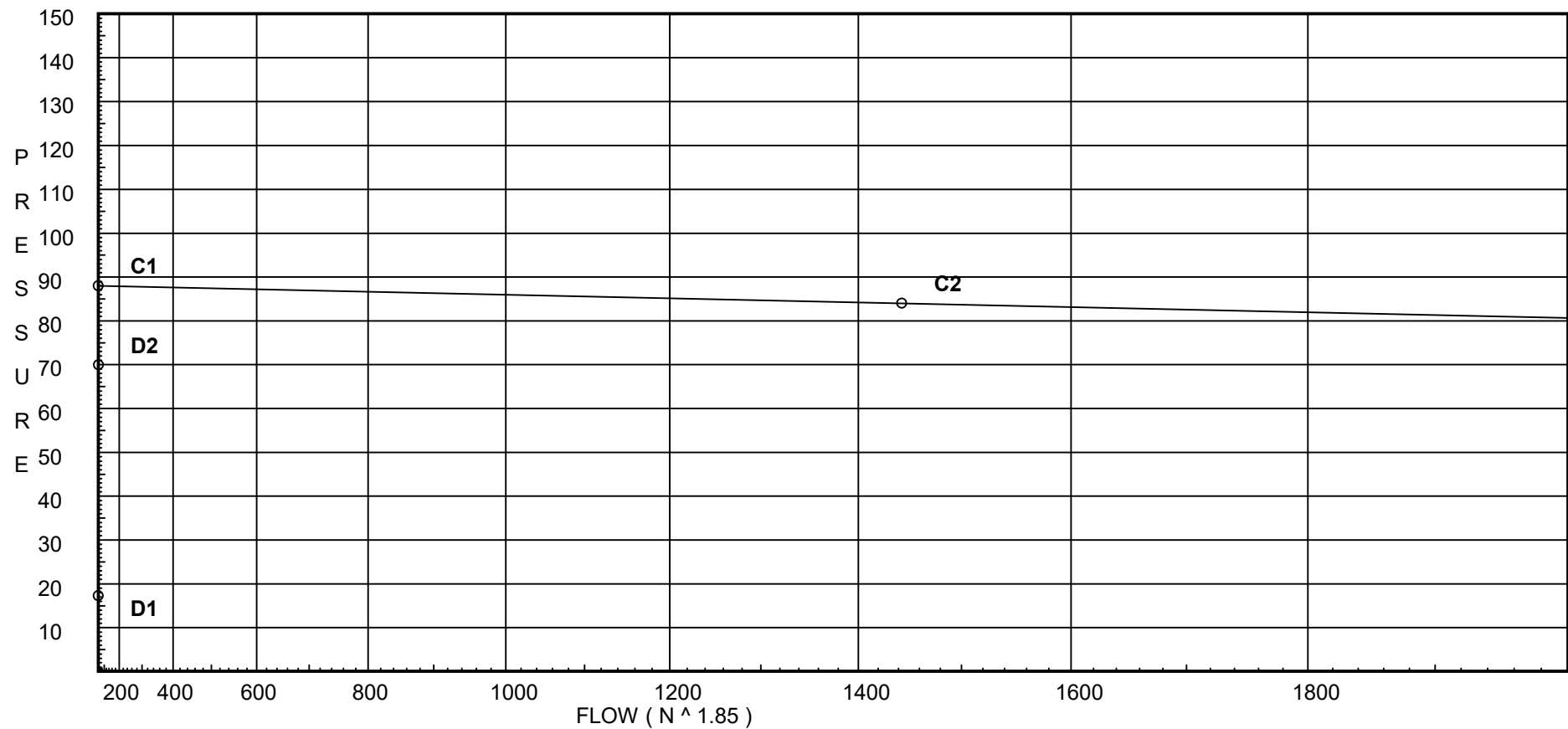
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City Water Supply:

C1 - Static Pressure : 88
C2 - Residual Pressure: 84
C2 - Residual Flow : 1443

Demand:

D1 - Elevation : 17.324
D2 - System Flow : 13.992
D2 - System Pressure : 69.947
Hose (Demand) :
D3 - System Demand : 13.992
Safety Margin : 18.052



Fittings Used Summary

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NLV DEVELOPMENT - UNIT F1.1 - One Head Calculation (H.1)

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Fitting Legend

Abbrev.	Name	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8	10	12	14	16	18	20	24
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
Ec *	Copper 90' Ell	1	1	2	2	2.5	3.5	4	5	6	7	9	10	0	0	0	0	0	0	0	0
T	NFPA 13 90' Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121
Tc *	Copper Tee-Branch	1.5	2	2	3	3.5	5	6	7.5	9	10.5	13	15	0	0	0	0	0	0	0	0
Tcs *	Copper Cplg/Tee-Run	0.5	0.5	0.5	1	1	1	1.5	1.5	2	2	2.5	3	0	0	0	0	0	0	0	0
Uel *	Aquapex 90 Elbow	11	11	12	11	13	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utb *	Aquapex Tee - Branch	2	17	14	9	12	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utr *	Aquapex Tee - Run	1	2	2	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Units Summary

Diameter Units Inches
Length Units Feet
Flow Units US Gallons per Minute
Pressure Units Pounds per Square Inch

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.

Flow Summary - NFPA

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SUPPLY ANALYSIS

<i>Node at Source</i>	<i>Static Pressure</i>	<i>Residual Pressure</i>	<i>Flow</i>	<i>Available Pressure</i>	<i>Total Demand</i>	<i>Required Pressure</i>
STR	88.0	84	1443.0	87.999	13.99	69.947

NODE ANALYSIS

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>	
H.1	135.0	3.7	14.3	13.99	0.05	256
T.28	135.0		14.79			
T.34	123.0		20.9			
T.35	123.0		21.44			
T.36	123.0		21.49			
T.53	110.0		27.38			
S.1	108.0		28.48			
PRV	95.0		39.36			
UG	95.0		44.42			
MTR	95.0		65.59			
STR	95.0		69.95			
T.27	135.0		14.45			
H.2	135.0		14.59			
T.29	135.0		14.76			
T.37	123.0		20.39			
H.11	123.0		20.55			
H.10	123.0		20.8			
T.33	123.0		20.87			
T.32	123.0		20.99			
T.46	110.0		27.05			
T.48	110.0		27.24			
H.19	110.0		27.28			
T.49	110.0		27.29			
T.51	110.0		27.35			
T.52	110.0		27.38			
H.5	135.0		14.8			
H.8	135.0		14.91			
T.31	135.0		14.96			
T.45	123.0		20.39			
H.15	123.0		20.56			
T.43	123.0		20.78			
T.39	123.0		20.91			
H.12	123.0		20.92			
T.40	123.0		20.95			
T.41	123.0		20.98			
T.42	123.0		21.11			
T.38	123.0		21.23			
H.3	135.0		14.85			
H.4	135.0		14.88			
T.30	135.0		14.96			
T.44	123.0		20.36			
H.16	123.0		20.38			

Flow Summary - NFPA

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NODE ANALYSIS (cont.)

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>
H.17	123.0		20.39		
H.7	135.0		14.96		
H.6	135.0		14.96		
H.9	135.0		14.96		
H.14	123.0		20.37		
H.13	123.0		20.97		
H.18	110.0		27.27		
T.47	110.0		27.28		
T.50	110.0		27.32		
T.56	110.0		27.34		
H.23	110.0		27.34		
H.24	110.0		27.35		
T.57	110.0		27.35		
T.54	110.0		27.36		
H.22	110.0		27.37		
T.55	110.0		27.37		
H.20	110.0		27.33		
H.21	110.0		27.34		
T.58	110.0		27.34		
T.59	110.0		27.34		
T.60	110.0		27.35		
H.25	110.0		27.35		
H.26	110.0		27.35		
T.61	110.0		27.35		

Final Calculations : Hazen-Williams

Uponor
NLV DEVELOPMENT - UNIT F1.1 - One Head Calculation (H.1)

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****	
*Remote Head to Supply													
H.1 to T.28	135	3.70	7.98	1	Utr	2.0	10.000 2.000	150	14.300 0.0				
T.28	135		7.98	0.862			12.000	0.0409	0.491	Vel =	4.39		
T.28 to T.34	135		-2.54	1	2Utb	34.0	17.000 28.000	150	14.791 5.197				
T.34	123		5.44	0.862			45.000	0.0202	0.907	Vel =	2.99		
T.34 to T.35	123		1.58	1	Utb	17.0	3.000 14.000	150	20.895 0.0				
T.35	123		7.02	0.862			17.000	0.0323	0.549	Vel =	3.86		
T.35 to T.36	123		3.61	1.25			4.000	150	21.444 0.0				
T.36	123		10.63	1.245			4.000	0.0118	0.047	Vel =	2.80		
T.36 to T.53	123		0.0	1.25	Tc Ec	3.0 2.0	17.000 5.000	150	21.491 5.630				
T.53	110		10.63	1.245			22.000	0.0116	0.255	Vel =	2.80		
T.53 to S.1	110		3.36	1.25	Tcs T	1.0 5.492	6.000 6.492	150	27.376 0.866				
S.1	108		13.99	1.245			12.492	0.0194	0.242	Vel =	3.69		
S.1 to PRV	108		0.0	1.25	E	2.746	10.000 2.746	150	28.484 10.630	* * Fixed Loss = 5			
PRV	95		13.99	1.245			12.746	0.0193	0.246	Vel =	3.69		
PRV to UG	95		0.0	0.75	E	1.414	15.000 1.414	150	39.360 0.0				
UG	95		13.99	0.705			16.414	0.3080	5.056	Vel =	11.50		
UG to MTR	95		0.0	0.75			5.000	150	44.416 20.000	* * Fixed Loss = 20			
MTR	95		13.99	0.745			5.000	0.2354	1.177	Vel =	10.30		
MTR to STR	95		0.0	0.75			10.000	150	65.593 2.000	* * Fixed Loss = 2			
STR	95		13.99	0.745			10.000	0.2354	2.354	Vel =	10.30		
			0.0							69.947	K Factor = 1.67		
			13.99										
*New Path													
H.1 to T.27	135		6.02	1	Utr	2.0	4.000 2.000	150	14.300 0.0				
T.27	135		6.02	0.862			6.000	0.0243	0.146	Vel =	3.31		
T.27 to H.2	135		0.0	1	Utr	2.0	4.000 2.000	150	14.446 0.0				
H.2	135		6.02	0.862			6.000	0.0242	0.145	Vel =	3.31		
H.2 to T.29	135		0.0	1	Utr	2.0	5.000 2.000	150	14.591 0.0				
T.29	135		6.02	0.862			7.000	0.0243	0.170	Vel =	3.31		
T.29 to T.37	135		-2.44	1	2Utb	34.0	19.000 28.000	150	14.761 5.197				
T.37	123		3.58	0.862			47.000	0.0093	0.436	Vel =	1.97		
T.37 to H.11	123		1.37	1	Utr	2.0	7.000 2.000	150	20.394 0.0				
H.11	123		4.95	0.862			9.000	0.0170	0.153	Vel =	2.72		

Final Calculations : Hazen-Williams

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
H.11 to H.10	123 123		0.0 4.95	1 0.862	Utr	2.0	13.000 2.000 15.000	150	20.547 0.0 0.253		Vel = 2.72	
H.10 to T.33	123 123		0.0 4.95	1 0.862	Utr	2.0	2.000 2.000 4.000	150	20.800 0.0 0.068		Vel = 2.72	
T.33 to T.32	123 123		-1.59 3.36	0.75 0.745	Tc Ec	2.0 1.0	4.000 3.000 7.000	150	20.868 0.0 0.118		Vel = 2.47	
T.32 to T.46	123 110		0.0 3.36	0.75 0.745			26.000 26.000	150	20.986 5.630 0.438		Vel = 2.47	
T.46 to T.48	110 110		0.0 3.36	0.75 0.745	Tc Ec	2.0 1.0	8.000 3.000 11.000	150	27.054 0.0 0.185		Vel = 2.47	
T.48 to H.19	110 110		-1.60 1.76	0.75 0.745	Tcs	0.5	8.000 0.500 8.500	150	27.239 0.0 0.043		Vel = 1.30	
H.19 to T.49	110 110		0.0 1.76	0.75 0.745			1.000 1.000	150	27.282 0.0 0.005		Vel = 1.30	
T.49 to T.51	110 110		0.0 1.76	0.75 0.745	Tcs Ec	0.5 1.0	10.000 1.500 11.500	150	27.287 0.0 0.059		Vel = 1.30	
T.51 to T.52	110 110		0.74 2.5	0.75 0.745	Tc	2.0	1.000 2.000 3.000	150	27.346 0.0 0.029		Vel = 1.84	
T.52 to T.53	110 110		0.86 3.36	1.25 1.245			1.000 1.000	150	27.375 0.0 0.001		Vel = 0.89	
T.53			0.0 3.36						27.376		K Factor = 0.64	
*New Path												
T.29 to H.5	135 135		2.44 2.44	1 0.862	Utr	2.0	6.000 2.000 8.000	150	14.761 0.0 0.037		Vel = 1.34	
H.5 to H.8	135 135		0.0 2.44	1 0.862	Utr	2.0	23.000 2.000 25.000	150	14.798 0.0 0.114		Vel = 1.34	
H.8 to T.31	135 135		0.0 2.44	1 0.862	Utr	2.0	8.000 2.000 10.000	150	14.912 0.0 0.046		Vel = 1.34	
T.31 to T.45	135 123		0.12 2.56	1 0.862	2Utb	34.0	18.750 28.000 46.750	150	14.958 5.197 0.234		Vel = 1.41	
T.45 to H.15	123 123		1.04 3.6	1 0.862	Utr	2.0	16.000 2.000 18.000	150	20.389 0.0 0.169		Vel = 1.98	

Final Calculations : Hazen-Williams

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
H.15 to T.43	123 123		0.0 3.6	1 0.862	Uel Utr 2.0	11.0 10.000 14.000 24.000	150 0.0094	20.558 0.0 0.226	Vel =	1.98	
T.43 to T.39	123 123		0.0 3.6	1 0.862	Uel 11.0	1.000 12.000 13.000	150 0.0094	20.784 0.0 0.122	Vel =	1.98	
T.39 to H.12	123 123		0.0 3.6	1 0.862	1.000	1.000	150 0.0100	20.906 0.0 0.010	Vel =	1.98	
H.12 to T.40	123 123		0.0 3.6	1 0.862	Utr 2.0	2.000 2.000 4.000	150 0.0095	20.916 0.0 0.038	Vel =	1.98	
T.40 to T.41	123 123		-0.42 3.18	1 0.862	Utr 2.0	2.000 2.000 4.000	150 0.0072	20.954 0.0 0.029	Vel =	1.75	
T.41 to T.42	123 123		0.42 3.6	1 0.862	Uel 11.0	1.000 12.000 13.000	150 0.0095	20.983 0.0 0.123	Vel =	1.98	
T.42 to T.38	123 123		0.0 3.6	1 0.862	Uel 11.0	1.000 12.000 13.000	150 0.0094	21.106 0.0 0.122	Vel =	1.98	
T.38 to T.35	123 123		0.0 3.6	1 0.862	Utb 17.0	9.000 14.000 23.000	150 0.0094	21.228 0.0 0.216	Vel =	1.98	
T.35			0.0 3.60					21.444	K Factor =	0.78	
*New Path											
T.28 to H.3	135 135		2.54 2.54	1 0.862	Utr 2.0	10.000 2.000 12.000	150 0.0049	14.791 0.0 0.059	Vel =	1.40	
H.3 to H.4	135 135		0.0 2.54	1 0.862	Utr 2.0	4.000 2.000 6.000	150 0.0048	14.850 0.0 0.029	Vel =	1.40	
H.4 to T.30	135 135		0.0 2.54	1 0.862	Utr 2.0	14.000 2.000 16.000	150 0.0049	14.879 0.0 0.079	Vel =	1.40	
T.30 to T.44	135 123		-0.12 2.42	1 0.862	2Utb 34.0	18.000 28.000 46.000	150 0.0045	14.958 5.197 0.206	Vel =	1.33	
T.44 to H.16	123 123		-1.38 1.04	1 0.862	Utr 2.0	14.000 2.000 16.000	150 0.0009	20.361 0.0 0.015	Vel =	0.57	
H.16 to H.17	123 123		0.0 1.04	1 0.862	9.000	9.000	150 0.0010	20.376 0.0 0.009	Vel =	0.57	
H.17 to T.45	123 123		0.0 1.04	1 0.862	Utr 2.0	2.000 2.000 4.000	150 0.0010	20.385 0.0 0.004	Vel =	0.57	

Final Calculations : Hazen-Williams

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
T.45			0.0 1.04						20.389		K Factor =	0.23
*New Path												
T.30 to H.7	135		0.12	1	Utr	2.0	5.000 2.000	150	14.958 0.0			
	135		0.12	0.862			7.000	0	0.0	Vel =	0.07	
H.7 to H.6	135		0.0	1	Utr	2.0	13.000 2.000	150	14.958 0.0			
	135		0.12	0.862			15.000	0	0.0	Vel =	0.07	
H.6 to H.9	135		0.0	1	Utr	2.0	16.000 2.000	150	14.958 0.0			
	135		0.12	0.862			18.000	0	0.0	Vel =	0.07	
H.9 to T.31	135		0.0	1			1.000	150	14.958 0.0			
	135		0.12	0.862			1.000	0	0.0	Vel =	0.07	
T.31			0.0 0.12						14.958		K Factor =	0.03
*New Path												
T.44 to H.14	123		1.37	1	Utr	2.0	3.000 2.000	150	20.361 0.0			
	123		1.37	0.862			5.000	0.0016	0.008	Vel =	0.75	
H.14 to T.37	123		0.0	1	Utr	2.0	14.000 2.000	150	20.369 0.0			
	123		1.37	0.862			16.000	0.0016	0.025	Vel =	0.75	
T.37			0.0 1.37						20.394		K Factor =	0.30
*New Path												
T.33 to T.34	123		1.58	1	Utr	2.0	11.000 2.000	150	20.868 0.0			
	123		1.58	0.862			13.000	0.0021	0.027	Vel =	0.87	
T.34			0.0 1.58						20.895		K Factor =	0.35
*New Path												
T.40 to H.13	123		0.43	0.75	Utb	17.0	6.000 17.000	150	20.954 0.0			
	123		0.43	0.671			23.000	0.0006	0.014	Vel =	0.39	
H.13 to T.41	123		0.0	0.75	Utb Utr	17.0 2.0	6.000 19.000	150	20.968 0.0			
	123		0.43	0.671			25.000	0.0006	0.015	Vel =	0.39	
T.41			0.0 0.43						20.983		K Factor =	0.09
*New Path												
T.48 to H.18	110		1.60	0.75	Tcs	0.5	6.000 0.500	150	27.239 0.0			
	110		1.6	0.745			6.500	0.0043	0.028	Vel =	1.18	
H.18 to T.47	110		0.0	0.75			2.000	150	27.267 0.0			
	110		1.6	0.745			2.000	0.0040	0.008	Vel =	1.18	

Final Calculations : Hazen-Williams

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
T.47 to T.50	110 110		0.0 1.6	0.75 0.745	Tcs Ec	0.5 1.0	10.000 1.500 11.500	150 0.0043	27.275 0.0 0.049		Vel = 1.18	
T.50 to T.56	110 110		-0.73 0.87	0.75 0.745	Tcs	0.5	12.000 0.500 12.500	150 0.0014	27.324 0.0 0.017		Vel = 0.64	
T.56 to H.23	110 110		-0.35 0.52	0.75 0.745	Tc Tcs	2.0 0.5	2.000 2.500 4.500	150 0.0007	27.341 0.0 0.003		Vel = 0.38	
H.23 to H.24	110 110		0.0 0.52	0.75 0.745			10.000 10.000	150 0.0005	27.344 0.0 0.005		Vel = 0.38	
H.24 to T.57	110 110		0.0 0.52	0.75 0.745	Tc Tcs	2.0 0.5	3.000 2.500 5.500	150 0.0005	27.349 0.0 0.003		Vel = 0.38	
T.57 to T.54	110 110		0.35 0.87	0.75 0.745	Tcs Ec	0.5 1.0	8.000 1.500 9.500	150 0.0014	27.352 0.0 0.013		Vel = 0.64	
T.54 to H.22	110 110		0.0 0.87	0.75 0.745	Tcs	0.5	1.000 0.500 1.500	150 0.0013	27.365 0.0 0.002		Vel = 0.64	
H.22 to T.55	110 110		0.0 0.87	0.75 0.745	Ec	1.0	1.000 1.000 2.000	150 0.0015	27.367 0.0 0.003		Vel = 0.64	
T.55 to T.52	110 110		0.0 0.87	0.75 0.745	Tc	2.0	2.000 2.000 4.000	150 0.0012	27.370 0.0 0.005		Vel = 0.64	
T.52			0.0 0.87						27.375		K Factor = 0.17	
*New Path												
T.50 to H.20	110 110		0.74 0.74	0.75 0.745	Tc	2.0	2.000 2.000 4.000	150 0.0010	27.324 0.0 0.004		Vel = 0.54	
H.20 to H.21	110 110		0.0 0.74	0.75 0.745	Tcs	0.5	10.000 0.500 10.500	150 0.0010	27.328 0.0 0.011		Vel = 0.54	
H.21 to T.51	110 110		0.0 0.74	0.75 0.745	Tc	2.0	5.000 2.000 7.000	150 0.0010	27.339 0.0 0.007		Vel = 0.54	
T.51			0.0 0.74						27.346		K Factor = 0.14	
*New Path												
T.56 to T.58	110 110		0.35 0.35	0.75 0.745			3.000 3.000	150 0.0003	27.341 0.0 0.001		Vel = 0.26	
T.58 to T.59	110 110		0.0 0.35	0.75 0.745	Ec	1.0	3.000 1.000 4.000	150 0.0002	27.342 0.0 0.001		Vel = 0.26	

Final Calculations : Hazen-Williams

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NLV DEVELOPMENT - UNIT F1.1 - One Head Calculation (H.1)

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
T.59 to T.60	110 110		0.0 0.35	0.75 0.745	Ec Tcs	1.0 1.0	8.000 1.000	150 0.0	27.343 0.0		
						9.000	0.0003	0.003	Vel =	0.26	
T.60 to H.25	110 110		0.0 0.35	0.75 0.745	Ec Tcs	1.0 0.5	1.000 1.500	150 0.0	27.346 0.0		
						2.500	0	0.0	Vel =	0.26	
H.25 to H.26	110 110		0.0 0.35	0.75 0.745			9.000	150 0.0	27.346 0.0		
						9.000	0.0002	0.002	Vel =	0.26	
H.26 to T.61	110 110		0.0 0.35	0.75 0.745	Ec Tcs	1.0 0.5	1.000 1.500	150 0.0	27.348 0.0		
						2.500	0.0004	0.001	Vel =	0.26	
T.61 to T.57	110 110		0.0 0.35	0.75 0.745			11.000	150 0.0	27.349 0.0		
						11.000	0.0003	0.003	Vel =	0.26	
T.57			0.0 0.35						27.352	K Factor =	0.07

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am NICET Certified.



Tim W McDonald Date: 09/21/2023

NICET Certification No. 150393

Water-Based Systems Layout - Level III

Certification Expires: June 1, 2025

Uponor

AquaSAFE™ Fire Safety System

Uponor
5925 148th Street West
Apple Valley, MN 55124
800-321-4739

Job Name : NLV DEVELOPMENT - UNIT F1.1 - Two Head Calculation (H.6 & H.3)
Drawing : RESIDENTIAL
Location : LONGVIEW & KESSLER LEES SUMMIT MO 6481
Remote Area : 1
Contract : 44424F 004
Data File : 44424F 004 NLV Development - Longview & Kessler - Fire, Unit
Date/Time : 09/21/2023 - 06:11 AM

HYDRAULIC DESIGN INFORMATION SHEET

Name - NLV DEVELOPMENT - UNIT F1.1 Date - 08/12/2023
Location - LEES SUMMIT MO 6481
Building - RESIDENTIAL System No. - 1
Contractor - S & B PLUMBING INC. Contract No. - 44424F 004
Calculated By - TIM McDONALD Drawing No. - F100
Construction: (X) Combustible () Non-Combustible Ceiling Height VARIES
OCCUPANCY - RESIDENTIAL

S Type of Calculation: () NFPA 13 Residential () NFPA 13R (X) NFPA 13D
Y Number of Sprinklers Flowing: () 1 (X) 2 () 4 ()
S () Other
T () Specific Ruling Made by Date
E
M Listed Flow at Start Point - 10 Gpm System Type
Listed Pres. at Start Point - 7.3 Psi (X) Wet () Dry
D MAXIMUM LISTED SPACING 14 x 14 () Deluge () PreAction
E Domestic Flow Added - 0 Gpm Sprinkler or Nozzle
S Additional Flow Added - Gpm Make SENJU Model RC-RESLF37
I Elevation at Highest Outlet - 135 Feet Size 7/16 K-Factor 3.7
G Note: Temperature Rating 162
N

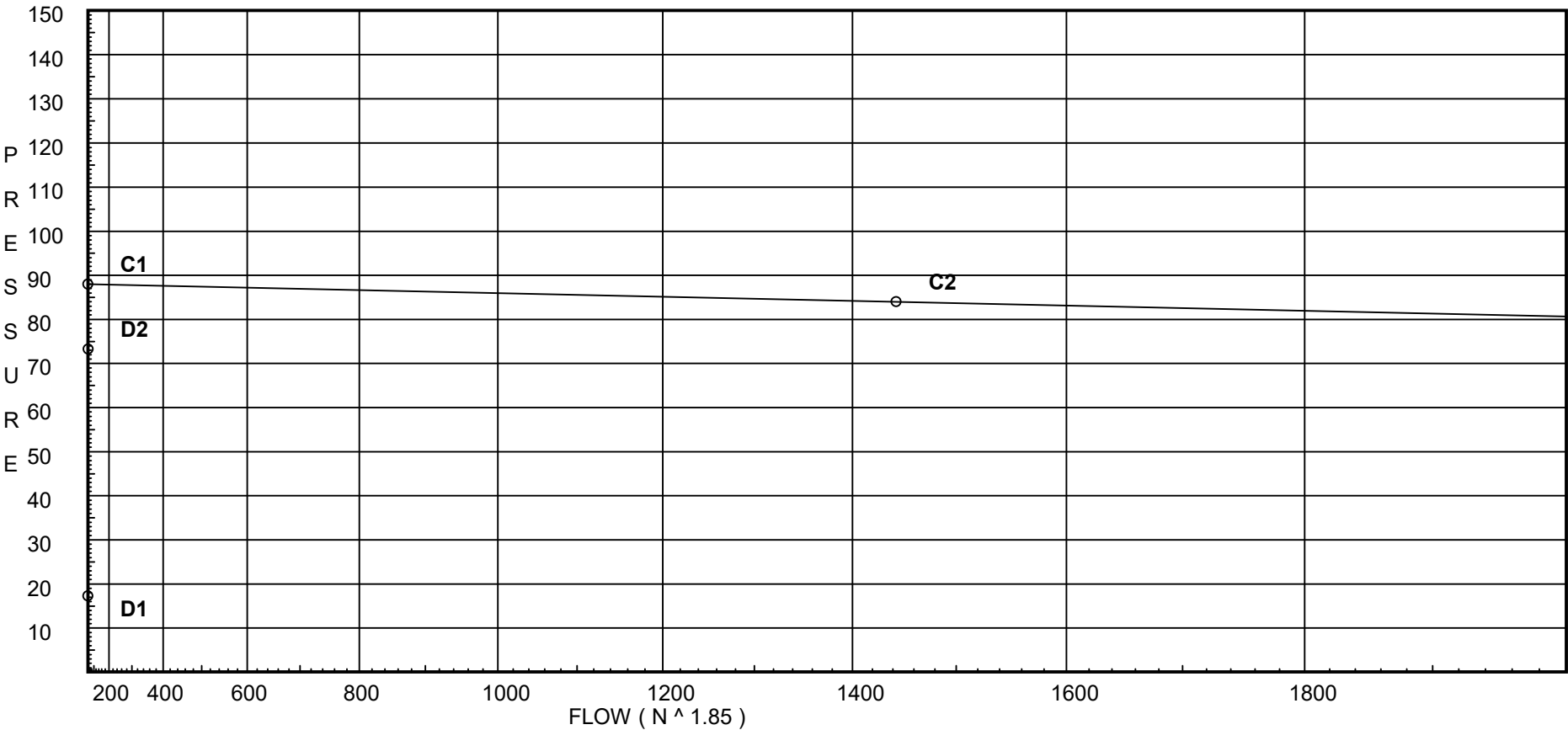
Calculation Gpm Required 20.0959 Psi Required 73.25 At Ref Pt STR
Summary C-Factor Used: Overhead 150 Underground 150

W Water Flow Test: Pump Data: Tank or Reservoir:
A Date of Test - x Rated Cap. Cap.
T Time of Test - x @ Psi Elev.
E Static (Psi) - 88 Elev.
R Residual (Psi) - 84 Other Well
Flow (Gpm) - 1443 Proof Flow Gpm
S Elevation - 95
P Location: STREET
P
L Source of Information: CONTRACTOR
Y

Water Supply Curve

City Water Supply:
C1 - Static Pressure : 88
C2 - Residual Pressure: 84
C2 - Residual Flow : 1443

Demand:
D1 - Elevation : 17.324
D2 - System Flow : 20.096
D2 - System Pressure : 73.249
Hose (Demand) :
D3 - System Demand : 20.096
Safety Margin : 14.750



Fittings Used Summary

Uponor
NLV DEVELOPMENT - UNIT F1.1 - Two Head Calculation (H.6 & H.3)

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Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
Ec *	Copper 90' Ell	1	1	2	2	2.5	3.5	4	5	6	7	9	10	0	0	0	0	0	0	0	0
T	NFPA 13 90' Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121
Tc *	Copper Tee-Branch	1.5	2	2	3	3.5	5	6	7.5	9	10.5	13	15	0	0	0	0	0	0	0	0
Tcs *	Copper Cplg/Tee-Run	0.5	0.5	0.5	1	1	1	1.5	1.5	2	2	2.5	3	0	0	0	0	0	0	0	0
Uel *	Aquapex 90 Elbow	11	11	12	11	13	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utb *	Aquapex Tee - Branch	2	17	14	9	12	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utr *	Aquapex Tee - Run	1	2	2	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Units Summary

Diameter Units Inches
Length Units Feet
Flow Units US Gallons per Minute
Pressure Units Pounds per Square Inch

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.

Flow Summary - NFPA

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NLV DEVELOPMENT - UNIT F1.1 - Two Head Calculation (H.6 & H.3)

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SUPPLY ANALYSIS

<i>Node at Source</i>	<i>Static Pressure</i>	<i>Residual Pressure</i>	<i>Flow</i>	<i>Available Pressure</i>	<i>Total Demand</i>	<i>Required Pressure</i>
STR	88.0	84	1443.0	87.999	20.1	73.249

NODE ANALYSIS

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>	
H.6	135.0	3.7	7.3	10.0	0.05	196
H.9	135.0		7.8			
T.31	135.0		7.83			
T.45	123.0		13.56			
H.15	123.0		13.92			
T.43	123.0		14.4			
T.39	123.0		14.66			
H.12	123.0		14.68			
T.40	123.0		14.76			
T.41	123.0		14.82			
T.42	123.0		15.08			
T.38	123.0		15.34			
T.35	123.0		15.8			
T.36	123.0		15.89			
T.53	110.0		22.02			
S.1	108.0		23.36			
PRV	95.0		34.47			
UG	95.0		44.35			
MTR	95.0		66.65			
STR	95.0		73.25			
H.7	135.0		7.43			
T.30	135.0		7.5			
T.44	123.0		13.51			
H.14	123.0		13.56			
T.37	123.0		13.71			
H.11	123.0		14.03			
H.10	123.0		14.56			
T.33	123.0		14.7			
T.32	123.0		14.93			
T.46	110.0		21.4			
T.48	110.0		21.76			
H.19	110.0		21.84			
T.49	110.0		21.85			
T.51	110.0		21.96			
T.52	110.0		22.02			
H.4	135.0	3.7	7.46			
H.3	135.0		7.45	10.1	0.05	196
T.28	135.0		8.0			
T.34	123.0		14.77			
H.8	135.0		7.88			
H.5	135.0		8.0			
T.29	135.0		8.04			

Flow Summary - NFPA

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NLV DEVELOPMENT - UNIT F1.1 - Two Head Calculation (H.6 & H.3)

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NODE ANALYSIS (cont.)

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>
H.1	135.0		8.02		
T.27	135.0		8.03		
H.2	135.0		8.03		
H.16	123.0		13.54		
H.17	123.0		13.55		
H.13	123.0		14.79		
H.18	110.0		21.81		
T.47	110.0		21.83		
T.50	110.0		21.92		
T.56	110.0		21.96		
H.23	110.0		21.96		
H.24	110.0		21.97		
T.57	110.0		21.98		
T.54	110.0		22.0		
H.22	110.0		22.0		
T.55	110.0		22.01		
H.20	110.0		21.93		
H.21	110.0		21.95		
T.58	110.0		21.96		
T.59	110.0		21.96		
T.60	110.0		21.96		
H.25	110.0		21.96		
H.26	110.0		21.97		
T.61	110.0		21.97		

Final Calculations : Hazen-Williams

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NLV DEVELOPMENT - UNIT F1.1 - Two Head Calculation (H.6 & H.3)

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
*Remote Head to Supply												
H.6 to H.9	135 135	3.70	6.50	1	Utr	2.0	16.000 2.000	150	7.300 0.0			
H.9 to T.31	135 135		6.5	0.862			18.000	0.0281	0.505	Vel =	3.57	
T.31 to T.45	135 123		0.0	1			1.000	150	7.805 0.0			
T.45 to H.15	123 123		6.5	0.862			1.000	0.0280	0.028	Vel =	3.57	
H.15 to T.43	123 123		-2.52	1	2Utb	34.0	18.750 28.000	150	7.833 5.197			
T.43 to T.39	123 123		3.98	0.862			46.750	0.0113	0.529	Vel =	2.19	
T.39 to H.12	123 123		1.44	1	Utr	2.0	16.000 2.000	150	13.559 0.0			
H.12 to T.41	123 123		5.42	0.862			18.000	0.0199	0.359	Vel =	2.98	
T.41 to T.42	123 123		0.0	1	Uel Utr	11.0 2.0	10.000 14.000	150	13.918 0.0			
T.42 to T.38	123 123		5.42	0.862			24.000	0.0200	0.480	Vel =	2.98	
T.38 to T.35	123 123		0.0	1	Uel	11.0	1.000 12.000	150	14.398 0.0			
T.35 to T.36	123 123		5.42	0.862			13.000	0.0200	0.260	Vel =	2.98	
T.36 to T.53	123 110		0.0	1			1.000	150	14.658 0.0			
T.53 to S.1	110 108		5.42	0.862			1.000	0.0200	0.020	Vel =	2.98	
S.1 to PRV	108 95		0.0	1	Utr	2.0	2.000 2.000	150	14.678 0.0			
PRV	95		5.42	0.862			4.000	0.0200	0.080	Vel =	2.98	
			-0.65	1	Utr	2.0	2.000 2.000	150	14.758 0.0			
			4.77	0.862			4.000	0.0158	0.063	Vel =	2.62	
			0.65	1	Uel	11.0	1.000 12.000	150	14.821 0.0			
			5.42	0.862			13.000	0.0200	0.260	Vel =	2.98	
			0.0	1	Uel	11.0	1.000 12.000	150	15.081 0.0			
			5.42	0.862			13.000	0.0200	0.260	Vel =	2.98	
			0.0	1	Utb	17.0	9.000 14.000	150	15.341 0.0			
			5.42	0.862			23.000	0.0200	0.460	Vel =	2.98	
			9.88	1.25			4.000	150	15.801 0.0			
			15.3	1.245			4.000	0.0228	0.091	Vel =	4.03	
			0.0	1.25	Tc Ec	3.0 2.0	17.000 5.000	150	15.892 5.630			
			15.3	1.245			22.000	0.0228	0.501	Vel =	4.03	
			4.80	1.25	Tcs T	1.0 5.492	6.000 6.492	150	22.023 0.866			
			20.1	1.245			12.492	0.0378	0.472	Vel =	5.30	
			0.0	1.25	E	2.746	10.000 2.746	150	23.361 10.630			
			20.1	1.245			12.746	0.0377	0.481	** Fixed Loss = 5 Vel =	5.30	

Final Calculations : Hazen-Williams

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NLV DEVELOPMENT - UNIT F1.1 - Two Head Calculation (H.6 & H.3)

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
PRV to UG	95 95		0.0 20.1	0.75 0.705	E	1.414	15.000 1.414 16.414	150 0.6018	34.472 0.0 9.878			
UG to MTR	95 95		0.0 20.1	0.75 0.745			5.000 5.000	150 0.4598	44.350 20.000 2.299		Vel = 16.52	
MTR to STR	95 95		0.0 20.1	0.75 0.745			10.000 10.000	150 0.4600	66.649 2.000 4.600		* * Fixed Loss = 20 Vel = 14.79	
STR			0.0 20.10						73.249		K Factor = 2.35	
*New Path												
H.6 to H.7	135 135		3.49	1	Utr	2.0	13.000 2.000 15.000	150 0.0089	7.300 0.0 0.133		Vel = 1.92	
H.7 to T.30	135 135		0.0	1	Utr	2.0	5.000 2.000 7.000	150 0.0089	7.433 0.0 0.062		Vel = 1.92	
T.30 to T.44	135 123		1.59	1	2Utb	34.0	18.000 28.000 46.000	150 0.0178	7.495 5.197 0.817		Vel = 2.79	
T.44 to H.14	123 123		-1.44	1	Utr	2.0	3.000 2.000 5.000	150 0.0096	13.509 0.0 0.048		Vel = 2.00	
H.14 to T.37	123 123		0.0	1	Utr	2.0	14.000 2.000 16.000	150 0.0096	13.557 0.0 0.153		Vel = 2.00	
T.37 to H.11	123 123		3.64	0.862			7.000 2.000 9.000	150 0.0354	13.710 0.0 0.319		Vel = 4.05	
H.11 to H.10	123 123		0.0	1	Utr	2.0	13.000 2.000 15.000	150 0.0353	14.029 0.0 0.530		Vel = 4.05	
H.10 to T.33	123 123		0.0	1	Utr	2.0	2.000 2.000 4.000	150 0.0352	14.559 0.0 0.141		Vel = 4.05	
T.33 to T.32	123 123		-2.58	0.75	Tc Ec	2.0 1.0	4.000 3.000 7.000	150 0.0326	14.700 0.0 0.228		Vel = 3.53	
T.32 to T.46	123 110		0.0	0.75			26.000 26.000	150 0.0325	14.928 5.630 0.844		Vel = 3.53	
T.46 to T.48	110 110		0.0	0.75	Tc Ec	2.0 1.0	8.000 3.000 11.000	150 0.0324	21.402 0.0 0.356		Vel = 3.53	
T.48 to H.19	110 110		-2.28	0.75	Tcs	0.5	8.000 0.500 8.500	150 0.0099	21.758 0.0 0.084		Vel = 1.85	

Final Calculations : Hazen-Williams

Uponor
NLV DEVELOPMENT - UNIT F1.1 - Two Head Calculation (H.6 & H.3)

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
H.19 to T.49	110 110		0.0 2.51	0.75 0.745			1.000 1.000	150 0.0100	21.842 0.0 0.010		Vel = 1.85	
T.49 to T.51	110 110		0.0 2.51	0.75 0.745	Tcs Ec	0.5 1.0	10.000 1.500 11.500	150 0.0098	21.852 0.0 0.113		Vel = 1.85	
T.51 to T.52	110 110		1.05 3.56	0.75 0.745	Tc	2.0	1.000 2.000 3.000	150 0.0187	21.965 0.0 0.056		Vel = 2.62	
T.52 to T.53	110 110		1.23 4.79	1.25 1.245			1.000 1.000	150 0.0020	22.021 0.0 0.002		Vel = 1.26	
T.53			0.0 4.79						22.023		K Factor = 1.02	
*New Path												
T.30 to H.4	135 135		-1.59 -1.59	1 0.862	Utr	2.0	14.000 2.000 16.000	150 -0.0021	7.495 0.0 -0.033		Vel = 0.87	
H.4 to H.3	135 135		0.0 -1.59	1 0.862	Utr	2.0	4.000 2.000 6.000	150 -0.0020	7.462 0.0 -0.012		Vel = 0.87	
H.3 to T.28	135 135	3.70	10.10 8.51	1 0.862	Utr	2.0	10.000 2.000 12.000	150 0.0462	7.450 0.0 0.554		Vel = 4.68	
T.28 to T.34	135 123		-1.20 7.31	1 0.862	2Utb	34.0	17.000 28.000 45.000	150 0.0348	8.004 5.197 1.565		Vel = 4.02	
T.34 to T.35	123 123		2.58 9.89	1 0.862	Utb	17.0	3.000 14.000 17.000	150 0.0609	14.766 0.0 1.035		Vel = 5.44	
T.35			0.0 9.89						15.801		K Factor = 2.49	
*New Path												
T.31 to H.8	135 135		2.52 2.52	1 0.862	Utr	2.0	8.000 2.000 10.000	150 0.0049	7.833 0.0 0.049		Vel = 1.39	
H.8 to H.5	135 135		0.0 2.52	1 0.862	Utr	2.0	23.000 2.000 25.000	150 0.0048	7.882 0.0 0.121		Vel = 1.39	
H.5 to T.29	135 135		0.0 2.52	1 0.862	Utr	2.0	6.000 2.000 8.000	150 0.0049	8.003 0.0 0.039		Vel = 1.39	
T.29 to T.37	135 123		1.21 3.73	1 0.862	2Utb	34.0	19.000 28.000 47.000	150 0.0100	8.042 5.197 0.471		Vel = 2.05	
T.37			0.0 3.73						13.710		K Factor = 1.01	

Final Calculations : Hazen-Williams

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NLV DEVELOPMENT - UNIT F1.1 - Two Head Calculation (H.6 & H.3)

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
*New Path											
T.28 to H.1	135 135		1.21	1	Utr 2.0	10.000 2.000	150	8.004 0.0			
H.1 to T.27	135 135		1.21	0.862		12.000	0.0012	0.015 0.0	Vel =	0.67	
H.1 to T.27	135 135		0.0	1	Utr 2.0	4.000 2.000	150	8.019 0.0			
T.27 to H.2	135 135		1.21	0.862		6.000	0.0012	0.007 0.0	Vel =	0.67	
T.27 to H.2	135 135		0.0	1	Utr 2.0	4.000 2.000	150	8.026 0.0			
H.2 to T.29	135 135		1.21	0.862		6.000	0.0012	0.007 0.0	Vel =	0.67	
H.2 to T.29	135 135		0.0	1	Utr 2.0	5.000 2.000	150	8.033 0.0			
T.29			1.21	0.862		7.000	0.0013	0.009	Vel =	0.67	
T.29			0.0								
T.29			1.21					8.042	K Factor =	0.43	
*New Path											
T.44 to H.16	123 123		1.44	1	Utr 2.0	14.000 2.000	150	13.509 0.0			
H.16 to H.17	123 123		1.44	0.862		16.000	0.0017	0.027 0.0	Vel =	0.79	
H.16 to H.17	123 123		0.0	1		9.000	150	13.536 0.0			
H.17 to T.45	123 123		1.44	0.862		9.000	0.0018	0.016 0.0	Vel =	0.79	
H.17 to T.45	123 123		0.0	1	Utr 2.0	2.000 2.000	150	13.552 0.0			
T.45			1.44	0.862		4.000	0.0018	0.007	Vel =	0.79	
T.45			0.0								
T.45			1.44					13.559	K Factor =	0.39	
*New Path											
T.33 to T.34	123 123		2.58	1	Utr 2.0	11.000 2.000	150	14.700 0.0			
T.34			2.58	0.862		13.000	0.0051	0.066	Vel =	1.42	
T.34			0.0								
T.34			2.58					14.766	K Factor =	0.67	
*New Path											
T.40 to H.13	123 123		0.64	0.75	Utb 17.0	6.000 17.000	150	14.758 0.0			
H.13 to T.41	123 123		0.64	0.671		23.000	0.0013	0.030 0.0	Vel =	0.58	
H.13 to T.41	123 123		0.0	0.75	Utb 17.0	6.000 19.000	150	14.788 0.0			
T.41			0.64	0.671	Utr 2.0	25.000	0.0013	0.033	Vel =	0.58	
T.41			0.0								
T.41			0.64					14.821	K Factor =	0.17	
*New Path											
T.48 to H.18	110 110		2.28	0.75	Tcs 0.5	6.000 0.500	150	21.758 0.0			
H.18 to T.47	110 110		2.28	0.745		6.500	0.0083	0.054 0.0	Vel =	1.68	
H.18 to T.47	110 110		0.0	0.75		2.000	150	21.812 0.0			
T.47			2.28	0.745		2.000	0.0080	0.016	Vel =	1.68	

Final Calculations : Hazen-Williams

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
T.47 to T.50	110 110		0.0 2.28	0.75 0.745	Tcs Ec 1.0	0.5 1.500 11.500	150 0.0083	21.828 0.0 0.095		Vel = 1.68	
T.50 to T.56	110 110		-1.05 1.23	0.75 0.745	Tcs 1.0	0.5 0.500 12.500	150 0.0026	21.923 0.0 0.033		Vel = 0.91	
T.56 to H.23	110 110		-0.49 0.74	0.75 0.745	Tc Tcs 0.5	2.0 2.500 4.500	150 0.0009	21.956 0.0 0.004		Vel = 0.54	
H.23 to H.24	110 110		0.0 0.74	0.75 0.745		10.000 10.000	150 0.0010	21.960 0.0 0.010		Vel = 0.54	
H.24 to T.57	110 110		0.0 0.74	0.75 0.745	Tc Tcs 0.5	2.0 2.500 5.500	150 0.0011	21.970 0.0 0.006		Vel = 0.54	
T.57 to T.54	110 110		0.49 1.23	0.75 0.745	Tcs Ec 1.0	0.5 1.500 9.500	150 0.0026	21.976 0.0 0.025		Vel = 0.91	
T.54 to H.22	110 110		0.0 1.23	0.75 0.745	Tcs 1.0	0.5 0.500 1.500	150 0.0027	22.001 0.0 0.004		Vel = 0.91	
H.22 to T.55	110 110		0.0 1.23	0.75 0.745	Ec 1.0	1.000 1.000 2.000	150 0.0025	22.005 0.0 0.005		Vel = 0.91	
T.55 to T.52	110 110		0.0 1.23	0.75 0.745	Tc 2.0	2.000 2.000 4.000	150 0.0028	22.010 0.0 0.011		Vel = 0.91	
T.52			0.0 1.23					22.021		K Factor = 0.26	
*New Path											
T.50 to H.20	110 110		1.05 1.05	0.75 0.745	Tc 1.0	2.0 2.000 4.000	150 0.0020	21.923 0.0 0.008		Vel = 0.77	
H.20 to H.21	110 110		0.0 1.05	0.75 0.745	Tcs 1.0	0.5 0.500 10.500	150 0.0019	21.931 0.0 0.020		Vel = 0.77	
H.21 to T.51	110 110		0.0 1.05	0.75 0.745	Tc 2.0	5.000 2.000 7.000	150 0.0020	21.951 0.0 0.014		Vel = 0.77	
T.51			0.0 1.05					21.965		K Factor = 0.22	
*New Path											
T.56 to T.58	110 110		0.50 0.5	0.75 0.745		3.000 3.000	150 0.0003	21.956 0.0 0.001		Vel = 0.37	
T.58 to T.59	110 110		0.0 0.5	0.75 0.745	Ec 1.0	3.000 1.000 4.000	150 0.0005	21.957 0.0 0.002		Vel = 0.37	

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
T.59 to T.60	110 110		0.0 0.5	0.75 0.745	Ec	1.0	8.000 1.000 9.000	150 0.0006	21.959 0.0 0.005		Vel = 0.37	
T.60 to H.25	110 110		0.0 0.5	0.75 0.745	Ec Tcs	1.0 0.5	1.000 1.500 2.500	150 0.0004	21.964 0.0 0.001		Vel = 0.37	
H.25 to H.26	110 110		0.0 0.5	0.75 0.745			9.000 9.000	150 0.0004	21.965 0.0 0.004		Vel = 0.37	
H.26 to T.61	110 110		0.0 0.5	0.75 0.745	Ec Tcs	1.0 0.5	1.000 1.500 2.500	150 0.0004	21.969 0.0 0.001		Vel = 0.37	
T.61 to T.57	110 110		0.0 0.5	0.75 0.745			11.000 11.000	150 0.0005	21.970 0.0 0.006		Vel = 0.37	
T.57			0.0 0.50						21.976		K Factor = 0.11	