

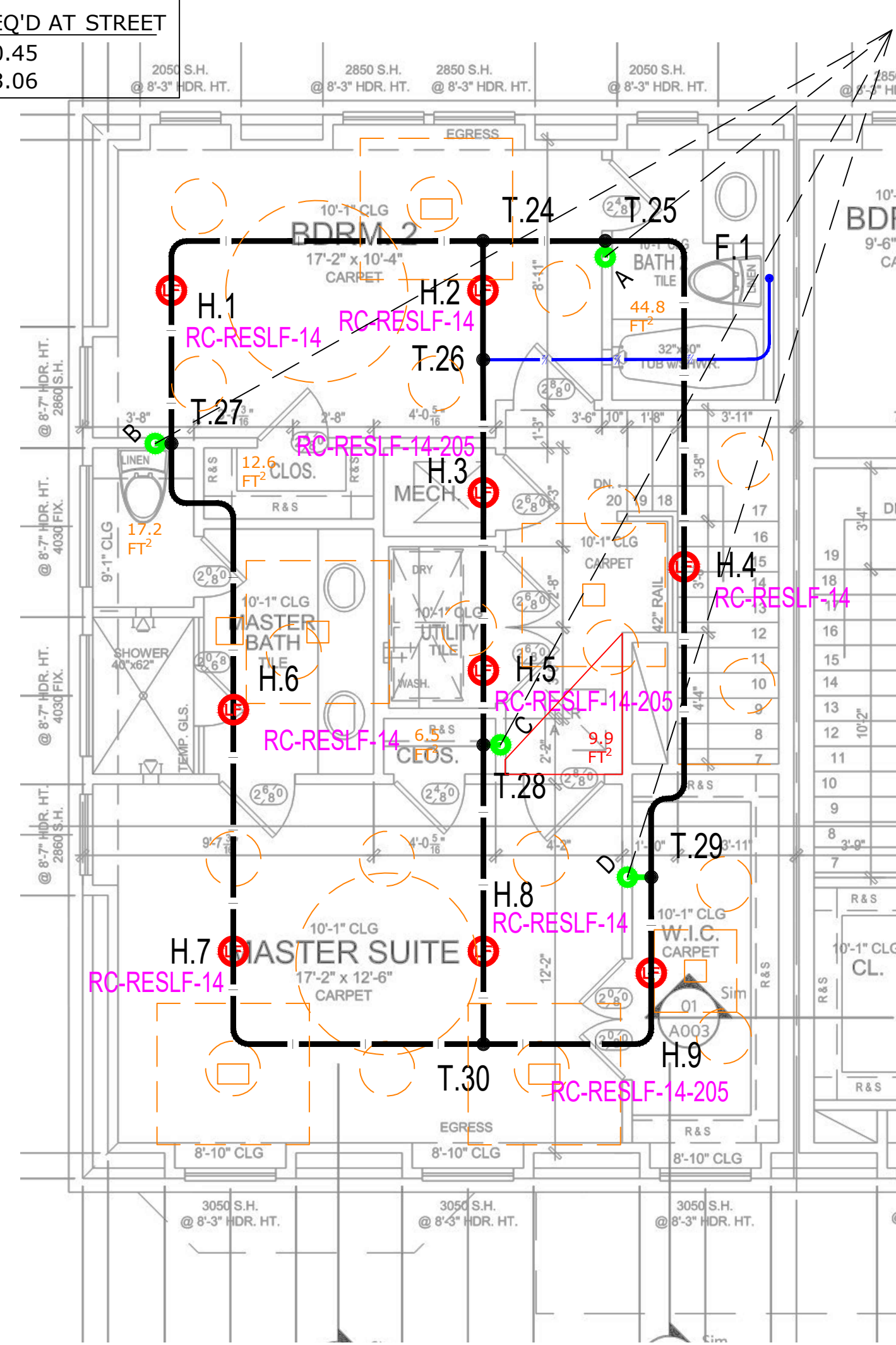
C:\Users\Tim.mcdonald\OneDrive - Uponor Corporation\General\44424 NLV Development-Longview & Kessler - Fire, Unit A1.1.dwg 08/21/23 - 9:29 am

Markup Legend	
Delete Line	
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Add Tee	
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Add Coupling	
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Note: All revisions must be reviewed by Uponor	

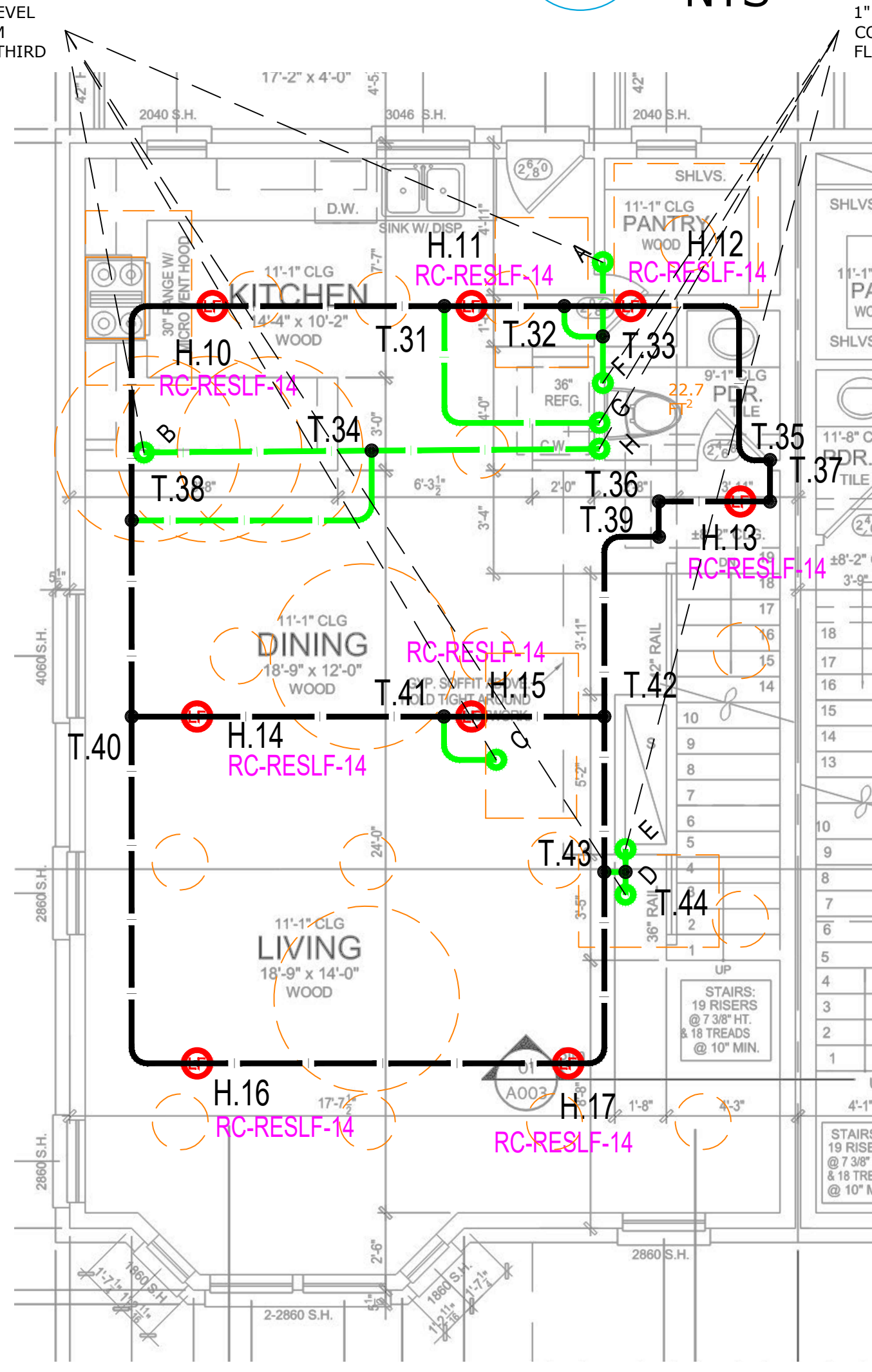
Table F002-1
Multipurpose Fire Safety Systems
The Uponor Residential Fire Safety System is a residential fire protections system installed in combination with the cold side of the domestic potable water system. Only licensed contractors trained by Uponor can install this system.

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).

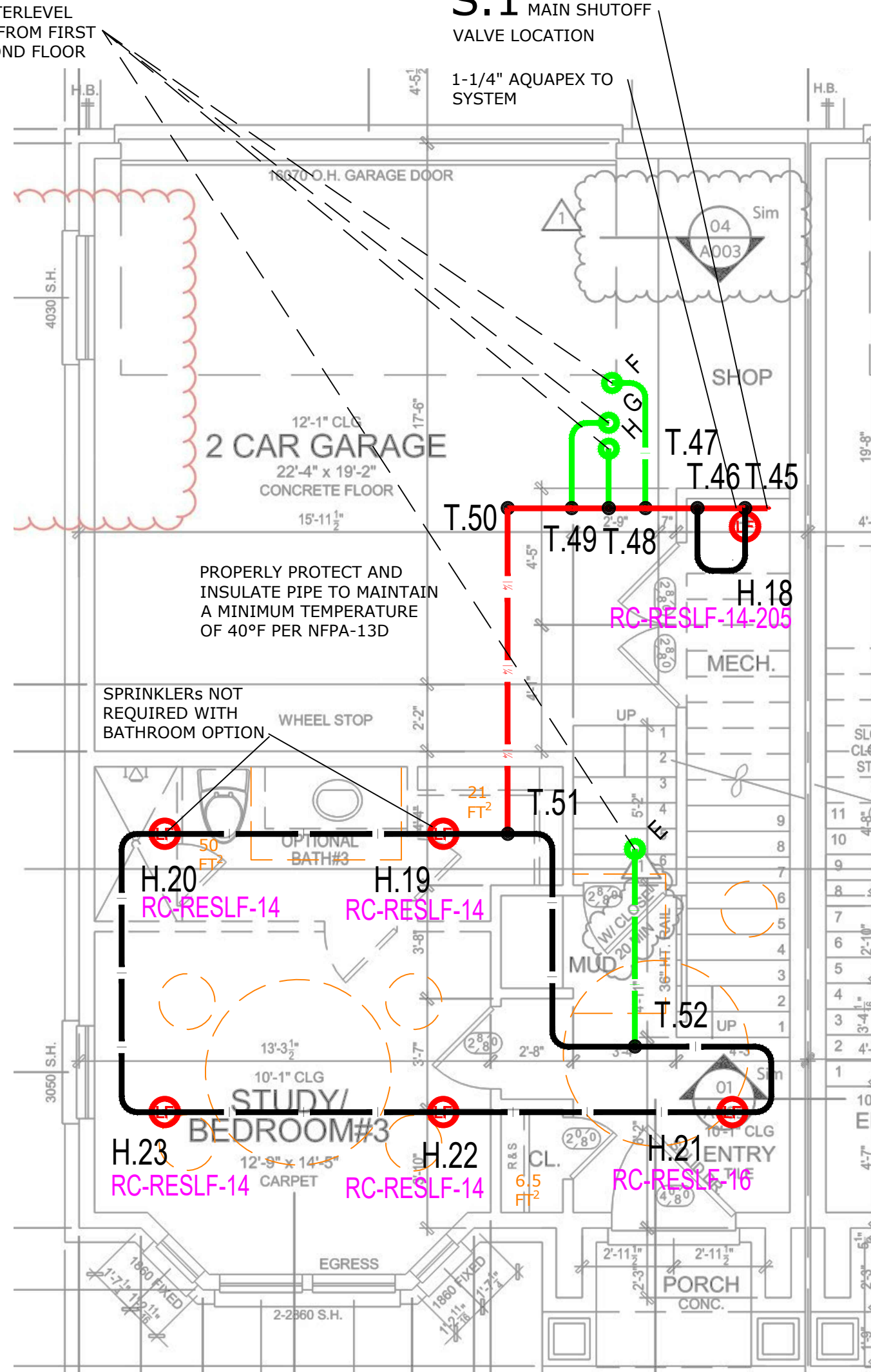
MOST HYDRAULICALLY REMOTE HEADS			
	HEAD #	GPM	PRESSURE REQ'D AT STREET
1 HEAD	H.3	11	60.45
2 HEAD	H.2 & H.1	20.109	73.06



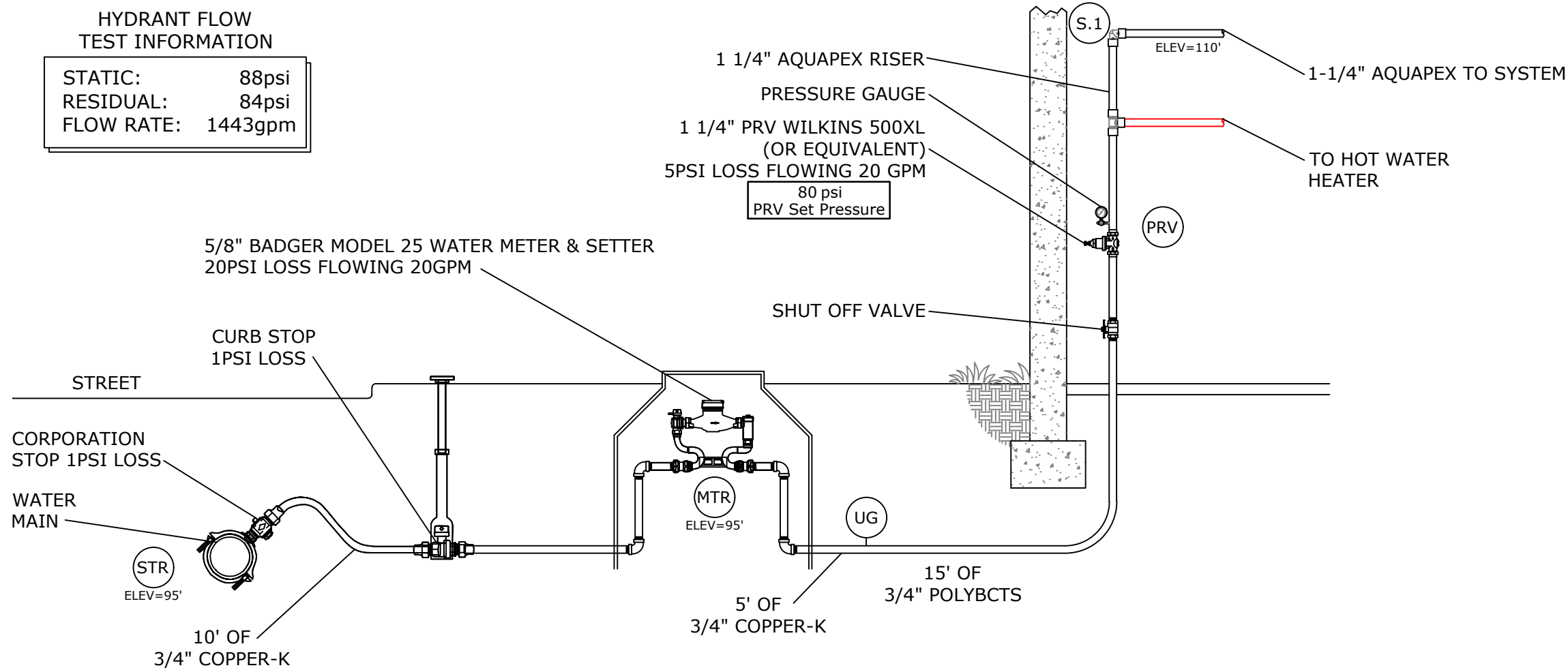
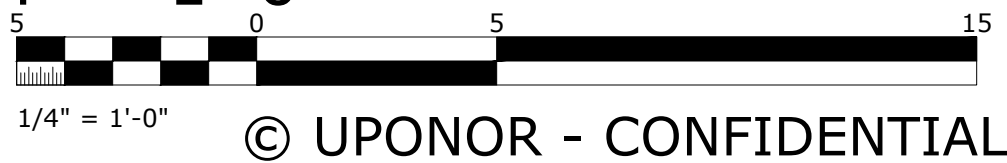
3
F100
THIRD FLOOR
1/4" = 1'-0"



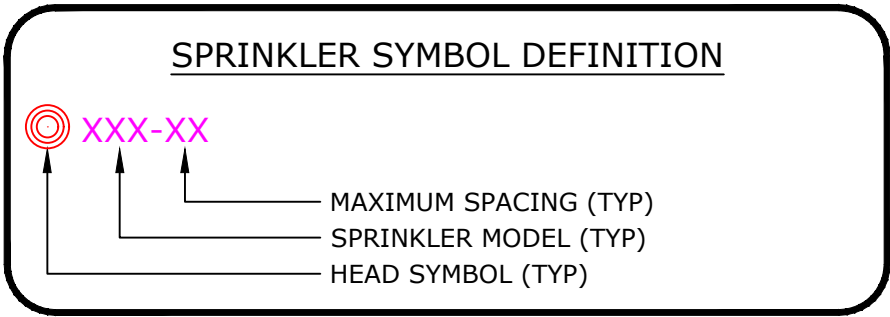
2
F100
SECOND FLOOR
1/4" = 1'-0"



1
F100
FIRST FLOOR
1/4" = 1'-0"



4
F100
WATER SERVICE DETAIL
NTS



- 1F - - - 18
RC-RESLF-14
SENJU Model RC-RESLF37 LowFlow K3.7 Residential Concealed Pendent SS8261
K=3.7, 162F°, 7/16" Orifice, Maximum Spacing 14"x14"
Sprinkler head demand: 10 gpm @ 7.3
- 1F - - - 4
RC-RESLF-14-205
SENJU Model RC-RESLFIT LowFlow K3.7 Residential Concealed Pendent SS8261
K=3.7, 205F°, 7/16" Orifice, Maximum Spacing 14"x14"
Sprinkler head demand: 11 gpm @ 8.8
- 1F - - - 1
RC-RESLF-16
SENJU Model RC-RESLF37 LowFlow K3.7 Residential Concealed Pendent SS8261
K=3.7, 162F°, 7/16" Orifice, Maximum Spacing 16"x16"
Sprinkler head demand: 14 gpm @ 14.3
- 5 1st Floor
8 2nd Floor
9 3rd Floor
22 TOTAL
- 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

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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 W McDonald Date: 08/21/2023
NICET Certification No. 150393
Water-Based Systems Layout - Level III
Certification Expires: June 1, 2025

NLV DEVELOPMENT - UNIT A1.1
LONGVIEW & KESSLER
LEES SUMMIT, MO 6481

SHEET DESCRIPTION
ALL FLOORS

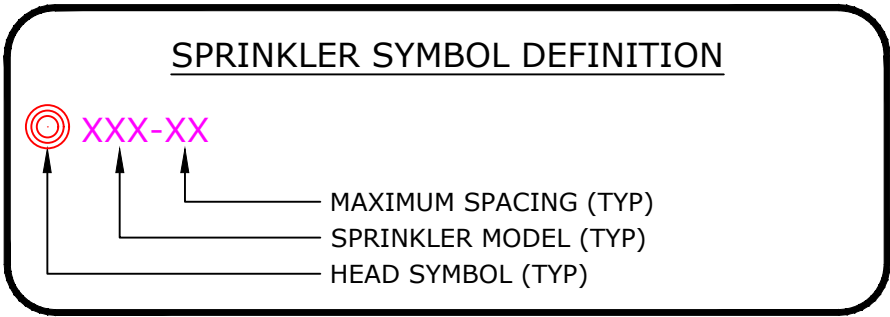
SHEET NUMBER

F100

DESIGN SERVICES
5925 148th Street West, Apple Valley, MN 55124
(888.594.7726) (952.939.7731)
FAX: (952.939.7726) EMAIL: DESIGNS@UPONOR.COM
WEB: WWW.UPONOR-USA.COM

SALES REP:

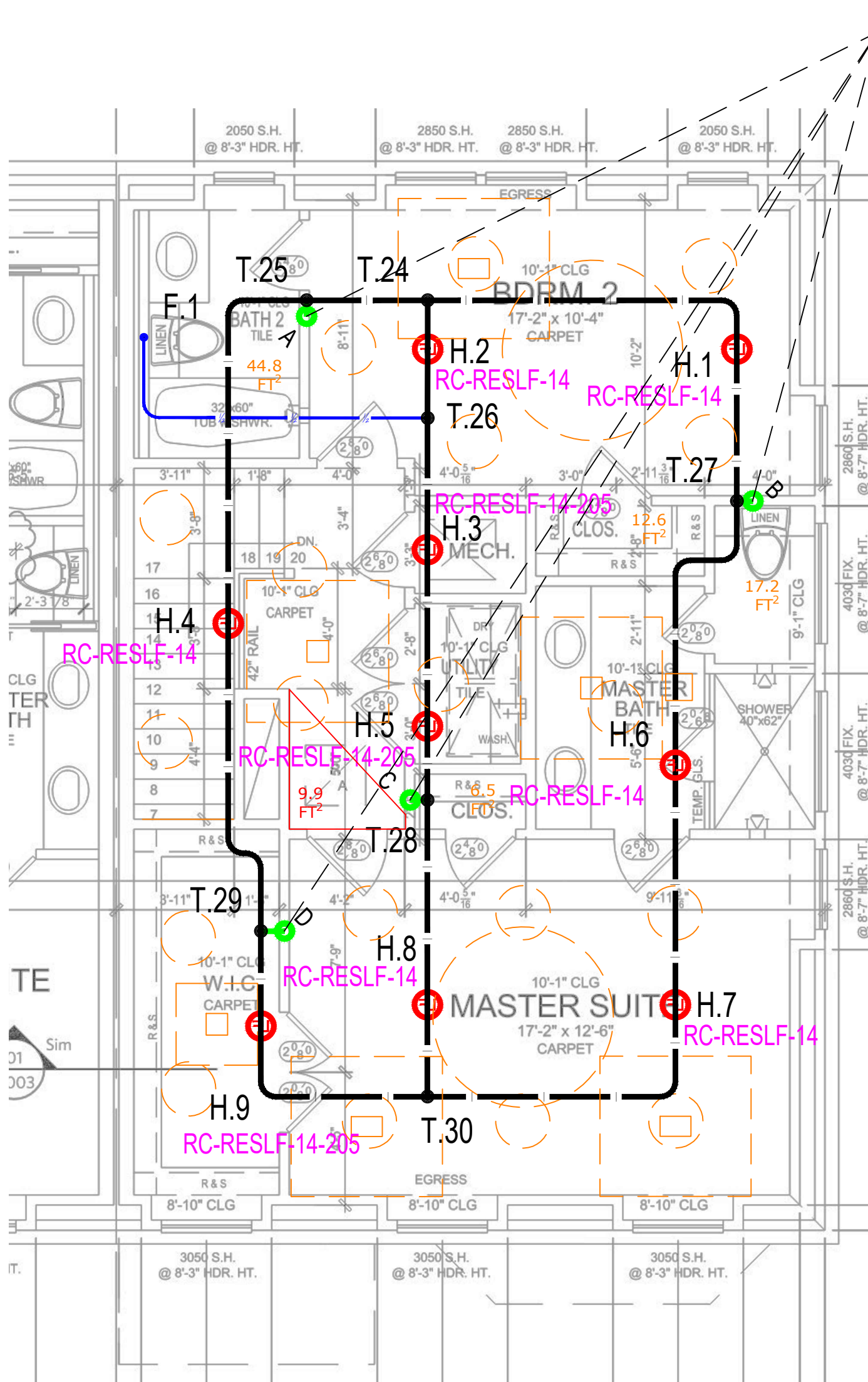
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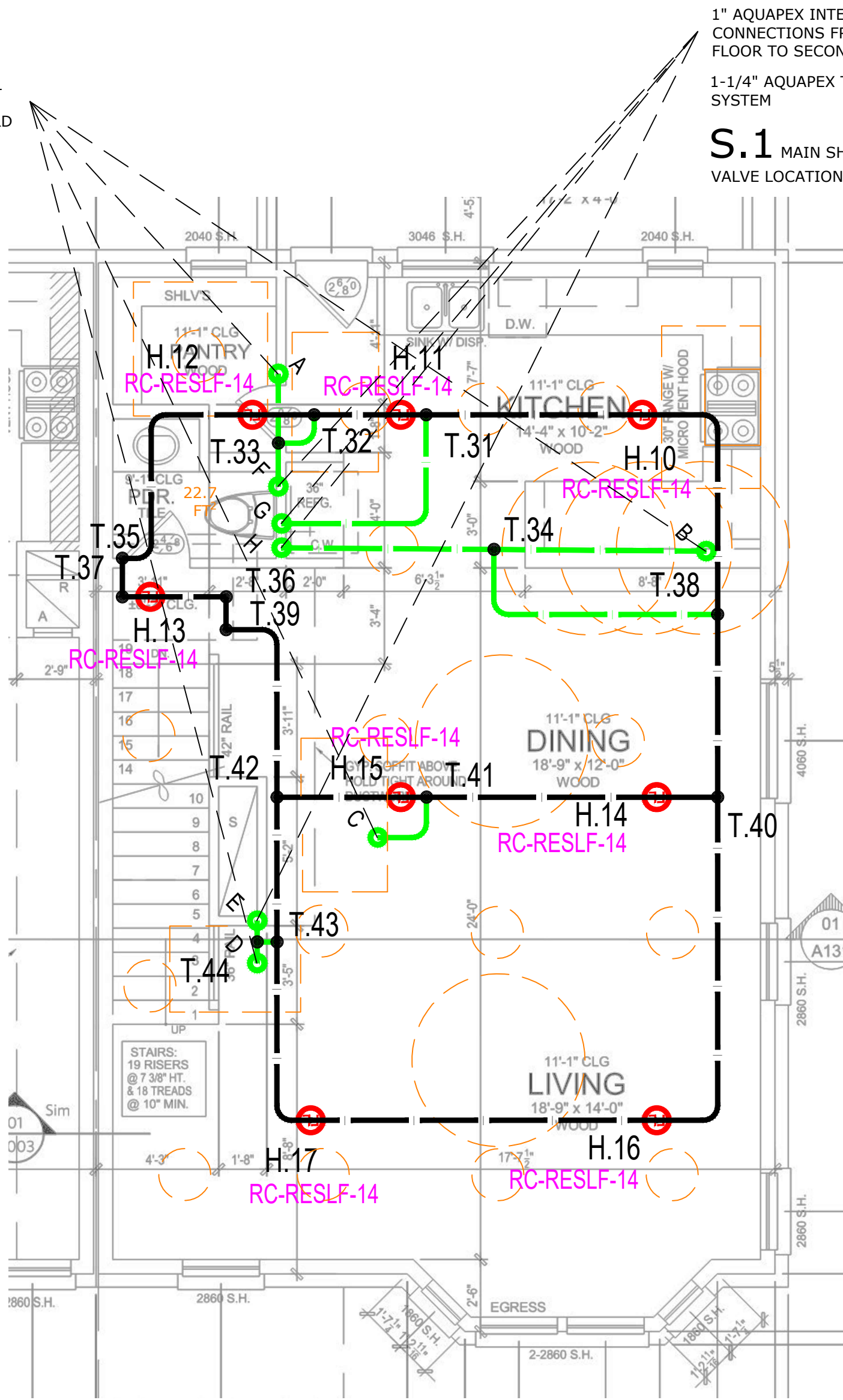
COLOR/LINETYPE LEGEND	
BLUE LINES=	FEED TO FIXTURES (BATH, SHOWER, ETC.).
GREEN LINES=	INTERLEVEL CONNECTIONS/SUPPLY.
BLACK LINES=	SPRINKLER HEAD TO SPRINKLER HEAD.
	= 1/2" PIPE SIZE
	= 3/4" PIPE SIZE
	= 1" PIPE SIZE
	= 1-1/4" PIPE SIZE

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

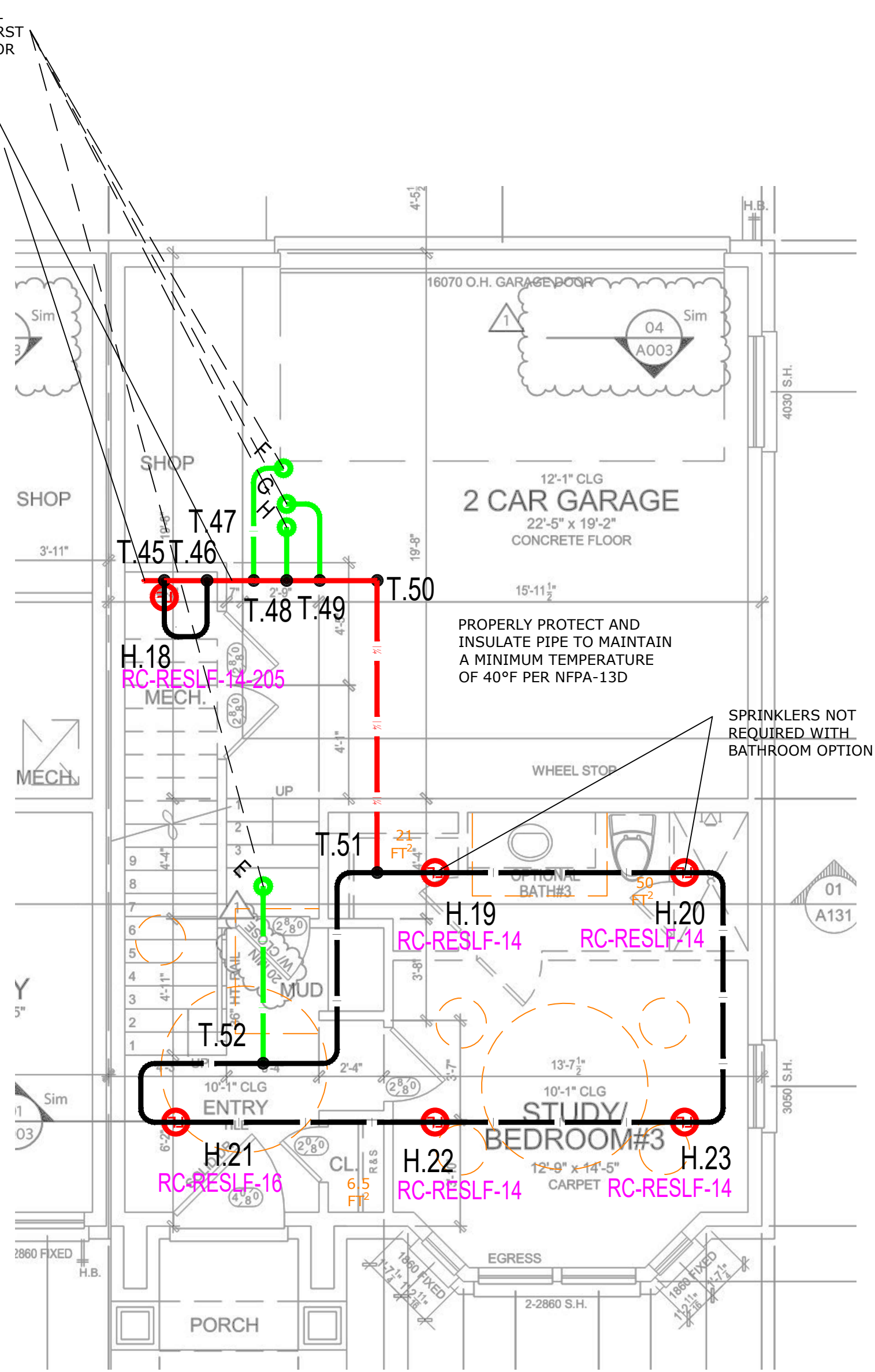
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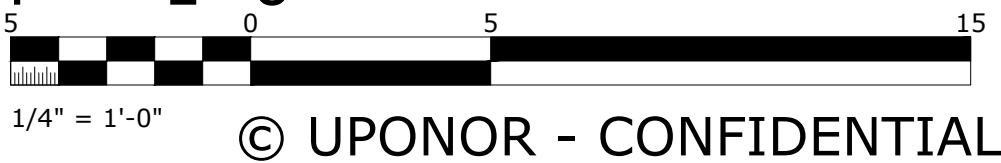
3
F101
THIRD FLOOR
1/4" = 1'-0"



2
F101
SECOND FLOOR
1/4" = 1'-0"



1
F101
FIRST FLOOR
1/4" = 1'-0"



DESIGN SERVICES
5925 148th Street West, Apple Valley, MN 55124
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NLV DEVELOPMENT - UNIT A1.1
LONGVIEW & KESSLER
LEES SUMMIT, MO 6481

SHEET DESCRIPTION
ALL FLOORS MIRROR

SHEET NUMBER

F101

COMPANY: S & B PLUMBING INC.	
PROJECT NUMBER: 44424E 001	CONTACT: MIKE STOREY
DRAWN BY: TIM McDONALD	CONTACT PH. NUMBER: 913.681.3075
CHECKED BY: BRENT KOTULA	ALLIANCE ID: 3017
CERTIFICATION LEVEL: SET IV	PLOT DATE: 08/17/2023
CERTIFICATION NUMBER: 113889	SHEET SCALE: 1/4" = 1'-0"
SQUARE FEET: 1874 SQ. FT.	REVISIONS
NO.	DATE
	DESCRIPTION

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 SYSTEM FOR THIS HOME SUPPLIES FIRE SPRINKLERS THAT REQUIRE CERTAIN FLOWS AND PRESSURES TO FIGHT 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 REVIEW OF THE FIRE SPRINKLER SYSTEM BY A FIRE PROTECTION SPECIALIST. **DO NOT REMOVE THIS SIGN**".

10. ALL INTERIOR PIPING TO BE UPONOR "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 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. NFPA 13D 8.2.5* OBSTRUCTIONS TO RESIDENTIAL SPRINKLERS

- 8.2.5.7* SHADOW AREAS SHALL BE PERMITTED IN THE PROTECTION AREA OF A SPRINKLER AS LONG AS THE CUMULATIVE DRY AREAS DO NOT EXCEED 15 FT² PER SPRINKLER.
- 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 FT² (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 PRIMARY 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. 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 220, STANDARD 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 ROOMS, 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 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 AT THE LOWER CEILING ELEVATION.
 - (3)* THE INTERIOR FINISH OF THE UNPROTECTED CEILING POCKET EXCLUDING DECORATIVE TREATMENTS IS NONCOMBUSTIBLE OR LIMITED-COMBUSTIBLE MATERIAL.
- 8.3.8 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 CLOSETS IN GARAGES AND EXTERIOR CLOSETS (REGARDLESS OF SIZE) LOCATED ON EXTERIOR BALCONIES, EXTERIOR BREEZEWAYS/CORRIDORS, OR ACCESSED 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 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. CONSULTATION WITH THE GENERAL CONTRACTOR AND/OR OWNER IS RECOMMENDED TO ENSURE PROPER METHODS AND MATERIALS ARE USED TO MAKE SURE 40°F WILL BE MAINTAINED.

ProPEX LF Brass Fire Sprinkler Adapter Tee

Blocking Maybe Required. If Blocking is Used, Use The 2 Top Screw Holes.

Fire Sprinkler Adapter Push-on Nut

1 $\frac{1}{4}$ " Min.
1 $\frac{1}{2}$ " Max.
Bottom of Mounting Bracket to Face of Truss

Fire Sprinkler Adapter Mounting Bracket

3-#10 x 1 $\frac{1}{2}$ " Full Course Thread Screws In Bottom Holes

Lead-Free Flat Concealed Senju Sprinkler Head

Concealed Flat Cover Plate

ProPEX LF Brass Fire Sprinkler Adapter Tee

Fire Sprinkler Adapter Push-on Nut

1 1/2" Min.
1 1/2" Max.
Bottom of Mounting Bracket to Face of Truss

Fire Sprinkler Adapter Mounting Bracket

2-#10 x 1 1/2" Full Course Thread Screws In Top Holes

5/8"

Lead-Free Flat Concealed Senju Sprinkler Head

Concealed Flat Cover Plate

1 Wood Joist left exposed in basement

2 Wood Blocking as required, metal strapping 6" from connection to fitting

3 Metal Strap location as required (Typical)

4 ProPEX EP Tee

5 ProPEX EP Elbow

6 AquaPEX White Pipe, Installed Exposed

7 AquaPEX White Pipe, Vertical Riser Installed Exposed

8 Residential pendent sprinkler located a max of 12" x 12" away from center line of exposed vertical riser.

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).

Extreme Temperature Installations

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.

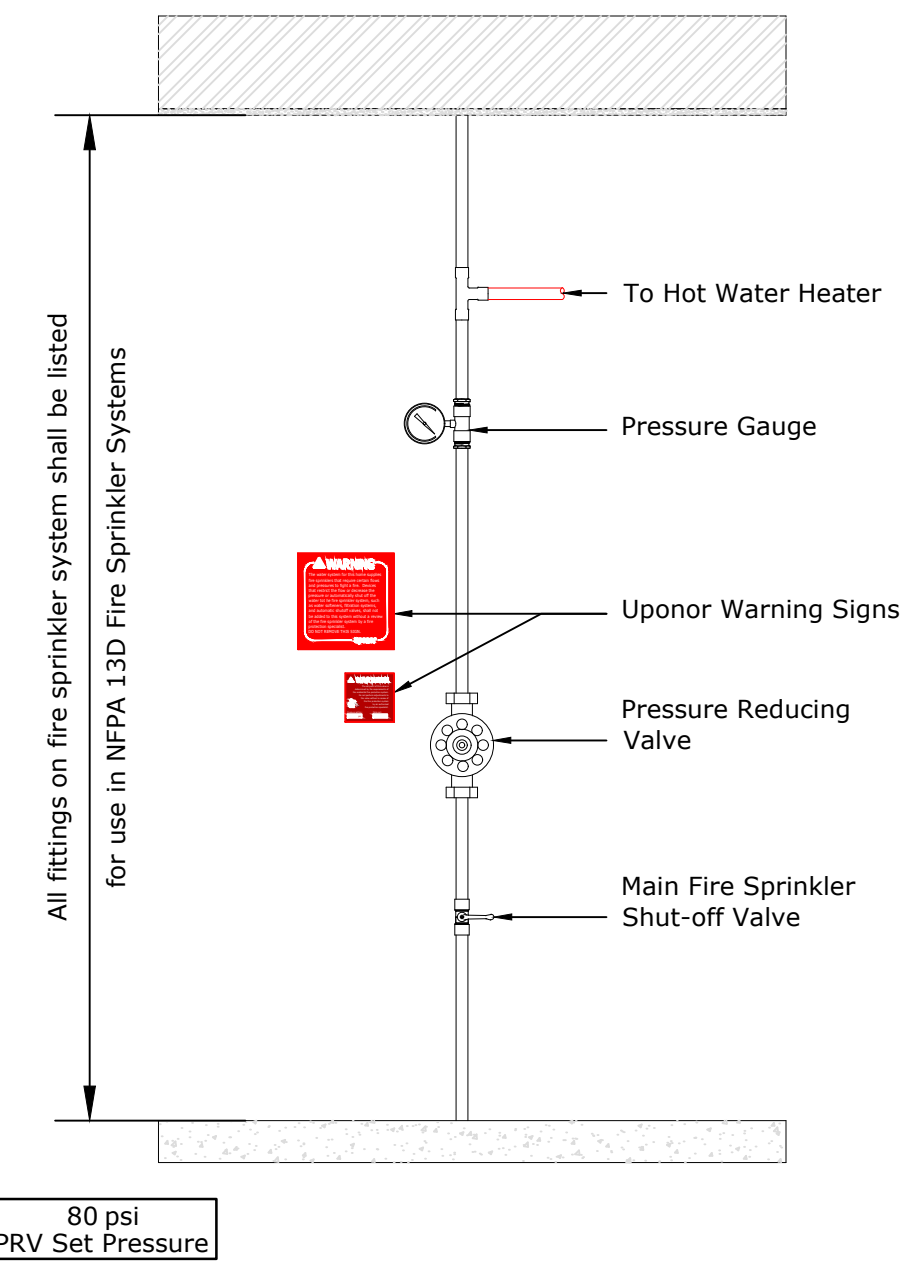
Consultation with local building officials is encouraged to ensure compliance with local building codes.

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.

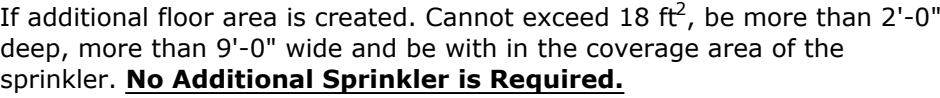
High Upstream Pressure

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.

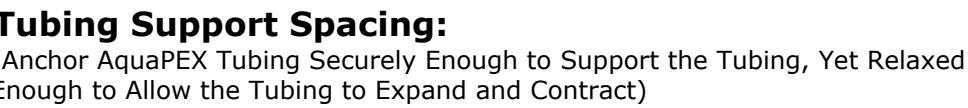
If the upstream pressure exceeds 80 psi a pressure reducing valve may need to be installed. Some jurisdictions may require a pressure reducing valve regardless of upstream pressure.



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

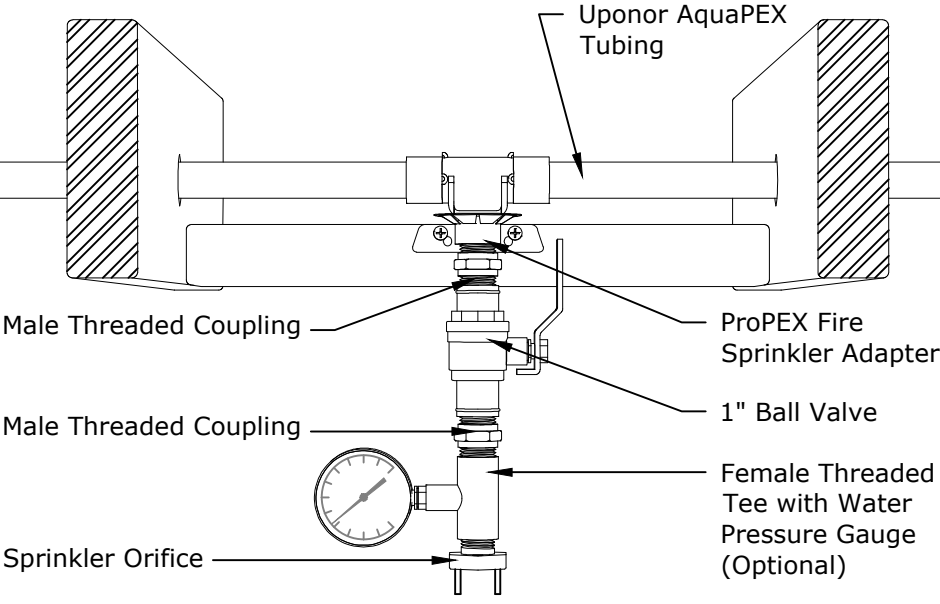


Heat Source	Ordinary Temp. 135°-170°	Intermediate Temp. 175°-225°
Side of Fireplace	36"	12"
Front of Fireplace	60"	36"
Wood Burning Stove	42"	12"
Kitchen Range	18"	9"
Wall Oven	18"	9"
Hot Air Flues	18"	9"
Uninsulated Heat Ducts	18"	9"
Uninsulated Hot Water Pipes	12"	6"
Side of Hot Air Diffuser	24"	12"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



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: 08/21/2023
NICET Certification No. 150393
Water-Based Systems Layout - Level III
Certification Expires: June 1, 2025

ONLY DEVELOPMENT - UNIT A1.1
LONGVIEW & KESSLER
LEES SUMMIT, MO 6481

PROJECT NUMBER:	44424F 001	COMPANY:	S & B PLUMBING INC.
DRAWN BY:	TIM McDONALD	CONTACT:	MIKE STOREY
CHECKED BY:	BRENT KOTULA	CONTACT PH. NUMBER:	913.681.5075
CERTIFICATION LEVEL:	SET TV	ALLIANCE ID:	3017
CERTIFICATION NUMBER:	113889	PLOT DATE:	08/11/2023
SQUARE FEET:	1874 SQ. FT.	SHEET SCALE:	1/4" = 1'-0"
REVISONS			
NO.	DATE	DESCRIPTION	

SHEET DESCRIPTION
GENERAL NOTES & DETAILS

F001

DESIGN SERVICES
5925 148th Street west, APPLE VALLEY, MN 55124
T 888.594.7726 **F** 952.997.1731
EMAIL DESIGN.SERVICES@UPONOR.COM
WEB WWW.UPONOR-USA.COM

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: 08/21/2023

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 A1.1 - One Head Calculation (H.3)
Drawing : RESIDENTIAL
Location : LONGVIEW & KESSLER LEES SUMMIT MO 6481
Remote Area : 1
Contract : 44424F 001
Data File : 44424F 001 NLV Development - Longview & Kessler - Fire, Unit
Date/Time : 08/21/2023 - 09:38 AM

HYDRAULIC DESIGN INFORMATION SHEET

Name - NLV DEVELOPMENT - UNIT A1.1 Date - 08/11/2023
Location - LEES SUMMIT MO 6481
Building - RESIDENTIAL System No. - 1
Contractor - S & B PLUMBING INC. Contract No. - 44424F 001
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 - 11 Gpm System Type
Listed Pres. at Start Point - 8.8 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-RESLFIT
I Elevation at Highest Outlet - 135 Feet Size 7/16 K-Factor 3.7
G Note: Temperature Rating 205
N

Calculation Gpm Required 11 Psi Required 60.45 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 A1.1 - One Head Calculation (H.3)

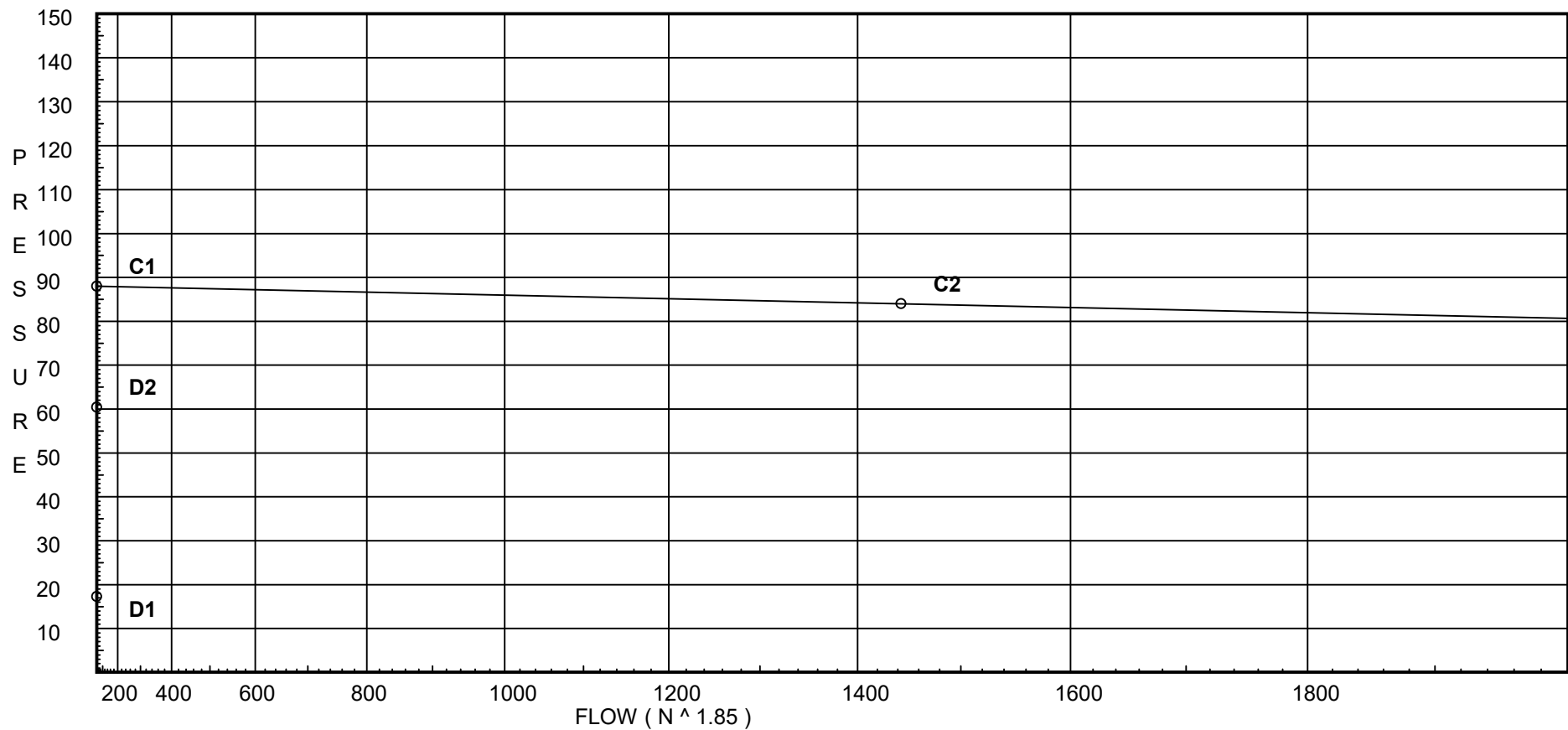
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City Water Supply:

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

Demand:

D1 - Elevation : 17.324
D2 - System Flow : 10.976
D2 - System Pressure : 60.455
Hose (Demand) :
D3 - System Demand : 10.976
Safety Margin : 27.544



Fittings Used Summary

Uponor
NLV DEVELOPMENT - UNIT A1.1 - One Head Calculation (H.3)

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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
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
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 A1.1 - One Head Calculation (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	88.0	10.98	60.455

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.3	135.0	3.7	8.8	10.98	0.05	196
H.5	135.0		9.0			
T.28	135.0		9.12			
T.41	123.0		14.63			
H.14	123.0		14.65			
T.40	123.0		14.68			
T.38	123.0		14.71			
H.10	123.0		14.73			
T.31	123.0		14.75			
T.49	110.0		20.59			
T.48	110.0		20.62			
T.47	110.0		20.63			
T.46	110.0		20.8			
T.45	110.0		20.93			
S.1	108.0		22.03			
PRV	95.0		32.98			
UG	95.0		36.2			
MTR	95.0		56.95			
STR	95.0		60.46			
T.26	135.0		8.91			
H.2	135.0		9.0			
T.24	135.0		9.29			
T.25	135.0		9.34			
T.33	123.0		14.74			
H.8	135.0		9.19			
T.30	135.0		9.3			
H.9	135.0		9.33			
T.29	135.0		9.35			
T.44	123.0		14.68			
T.52	110.0		20.48			
T.51	110.0		20.53			
T.50	110.0		20.58			
H.1	135.0		9.32			
T.27	135.0		9.34			
T.34	123.0		14.72			
H.7	135.0		9.32			
H.6	135.0		9.32			
H.4	135.0		9.34			
H.15	123.0		14.64			
T.42	123.0		14.67			
T.39	123.0		14.69			
T.36	123.0		14.7			

Flow Summary - NFPA

Uponor
NLV DEVELOPMENT - UNIT A1.1 - One Head Calculation (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.13	123.0		14.71		
T.37	123.0		14.72		
T.35	123.0		14.73		
H.12	123.0		14.74		
T.32	123.0		14.74		
H.11	123.0		14.75		
T.43	123.0		14.68		
H.17	123.0		14.68		
H.16	123.0		14.68		
H.21	110.0		20.48		
H.22	110.0		20.49		
H.23	110.0		20.5		
H.20	110.0		20.51		
H.19	110.0		20.52		
H.18	110.0		20.87		

Final Calculations : Hazen-Williams

Uponor
NLV DEVELOPMENT - UNIT A1.1 - One Head Calculation (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	*****
*Remote Head to Supply											
H.3 to H.5	135 135	3.70	6.11	1	Utr 2.0	6.000 2.000 8.000	150 0.0250	8.800 0.0 0.200			Vel = 3.36
H.5 to T.28	135 135		0.0	1	Utr 2.0	3.000 2.000 5.000	150 0.0248	9.000 0.0 0.124			Vel = 3.36
T.28 to T.41	135 123		-3.03	1	2Utb 34.0	16.000 28.000 44.000	150 0.0070	9.124 5.197 0.309			Vel = 1.69
T.41 to H.14	123 123		-1.54	1		9.000	150	14.630 0.0			
H.14 to T.40	123 123		1.54	0.862		9.000	0.0020	0.018		Vel = 0.85	
H.14 to T.40	123 123		0.0	1	Utb 17.0 Utr 2.0	2.000 16.000 18.000	150 0.0019	14.648 0.0 0.035			Vel = 0.85
T.40 to T.38	123 123		0.42	1	Utr 2.0	7.000 2.000 9.000	150 0.0030	14.683 0.0 0.027			Vel = 1.08
T.38 to H.10	123 123		-0.54	1	Utr 2.0	10.000 2.000 12.000	150 0.0017	14.710 0.0 0.020			Vel = 0.78
H.10 to T.31	123 123		0.0	1	Utr 2.0	8.000 2.000 10.000	150 0.0017	14.730 0.0 0.017			Vel = 0.78
T.31 to T.49	123 110		0.79	1	2Utb 34.0	27.000 28.000 55.000	150 0.0038	14.747 5.630 0.209			Vel = 1.21
T.49 to T.48	110 110		2.52	1.25	Utr 4.0	1.000 4.000 5.000	150 0.0060	20.586 0.0 0.030			Vel = 1.74
T.48 to T.47	110 110		4.73	1.054		1.000	150	20.616 0.0			
T.47 to T.46	110 110		7.83	1.054		1.000	0.0140	0.014		Vel = 2.88	
T.46 to T.45	110 110		3.15	1.25	Utr 4.0	2.000 4.000 6.000	150 0.0278	20.630 0.0 0.167			Vel = 4.04
T.45 to S.1	110 108		-1.10	1.25	Utr 4.0	2.000 4.000 6.000	150 0.0228	20.797 0.0 0.137			Vel = 3.63
S.1 to PRV	108 95		9.88	1.054		8.440	0.0277	0.234		Vel = 4.04	
PRV to UG	95 95		0.0	1.25	E 1.22	10.000 1.220 11.220	150 0.0277	22.034 10.630 0.311		** Fixed Loss = 5 Vel = 4.04	
UG	95		10.98	0.75	E 1.414	15.000 1.414 16.414	150 0.1966	32.975 0.0 3.227		Vel = 9.02	

Final Calculations : Hazen-Williams

Uponor
NLV DEVELOPMENT - UNIT A1.1 - One Head Calculation (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	*****
UG to MTR	95 95		0.0 10.98	0.75 0.745			5.000 5.000	150 0.1502	36.202 20.000 0.751		* * Fixed Loss = 20 Vel = 8.08	
MTR to STR	95 95		0.0 10.98	0.75 0.745			10.000 10.000	150 0.1502	56.953 2.000 1.502		* * Fixed Loss = 2 Vel = 8.08	
STR			0.0 10.98						60.455		K Factor = 1.41	
*New Path												
H.3 to T.26	135 135		4.87	1	Utr	2.0	5.000 2.000 7.000	150	8.800 0.0 0.115		Vel = 2.68	
T.26 to H.2	135 135		0.0 4.87	1	Utr	2.0	3.000 2.000 5.000	150	8.915 0.0 0.082		Vel = 2.68	
H.2 to T.24	135 135		0.0 4.87	1	Utb Utr	17.0 2.0	2.000 16.000 18.000	150	8.997 0.0 0.296		Vel = 2.68	
T.24 to T.25	135 135		-1.54 3.33	1	Utr	2.0	4.000 2.000 6.000	150	9.293 0.0 0.048		Vel = 1.83	
T.25 to T.33	135 123		-0.40 2.93	1	Utr Utb	2.0 17.0	16.000 16.000 32.000	150	9.341 5.197 0.206		Vel = 1.61	
T.33 to T.47	123 110		0.21 3.14	1	Utb	17.0	21.000 14.000 35.000	150	14.744 5.630 0.256		Vel = 1.73	
T.47			0.0 3.14						20.630		K Factor = 0.69	
*New Path												
T.28 to H.8	135 135		3.03	1	Utr	2.0	7.000 2.000 9.000	150	9.124 0.0 0.062		Vel = 1.67	
H.8 to T.30	135 135		0.0 3.03	1	Utb	17.0	3.000 14.000 17.000	150	9.186 0.0 0.116		Vel = 1.67	
T.30 to H.9	135 135		-1.03 2.0	1			9.000 9.000	150	9.302 0.0 0.028		Vel = 1.10	
H.9 to T.29	135 135		0.0 2.0	1	Utr	2.0	3.000 2.000 5.000	150	9.330 0.0 0.016		Vel = 1.10	
T.29 to T.44	135 123		0.40 2.4	1	Utr Utb	2.0 17.0	14.000 16.000 30.000	150	9.346 5.197 0.133		Vel = 1.32	
T.44 to T.52	123 110		0.12 2.52	1	Utb	17.0	21.000 14.000 35.000	150	14.676 5.630 0.170		Vel = 1.39	

Final Calculations : Hazen-Williams

Uponor
NLV DEVELOPMENT - UNIT A1.1 - One Head Calculation (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	*****
T.52 to T.51	110 110		-0.94 1.58	1 0.862	Utr Utb	2.0 17.0	12.000 16.000 28.000	150 0.0020	20.476 0.0 0.057			
										Vel =	0.87	
T.51 to T.50	110 110		0.94 2.52	1.25 1.054	Uel	11.0	12.000 11.000 23.000	150 0.0018	20.533 0.0 0.042			
										Vel =	0.93	
T.50 to T.49	110 110		0.0 2.52	1.25 1.054	Utr	4.0	2.000 4.000 6.000	150 0.0018	20.575 0.0 0.011			
										Vel =	0.93	
T.49			0.0 2.52						20.586	K Factor =	0.56	
*New Path												
T.24 to H.1	135 135		1.54 1.54	1 0.862	Utr	2.0	13.000 2.000 15.000	150 0.0019	9.293 0.0 0.029			
										Vel =	0.85	
H.1 to T.27	135 135		0.0 1.54	1 0.862	Utr	2.0	6.000 2.000 8.000	150 0.0020	9.322 0.0 0.016			
										Vel =	0.85	
T.27 to T.34	135 123		1.03 2.57	1 0.862	Utr Utb	2.0 17.0	21.000 16.000 37.000	150 0.0050	9.338 5.197 0.186			
										Vel =	1.41	
T.34 to T.48	123 110		0.53 3.1	1 0.862	Utb	17.0	23.000 14.000 37.000	150 0.0072	14.721 5.630 0.265			
										Vel =	1.70	
T.48			0.0 3.10						20.616	K Factor =	0.68	
*New Path												
T.30 to H.7	135 135		1.03 1.03	1 0.862	Utr	2.0	12.000 2.000 14.000	150 0.0009	9.302 0.0 0.013			
										Vel =	0.57	
H.7 to H.6	135 135		0.0 1.03	1 0.862	Utr	2.0	9.000 2.000 11.000	150 0.0009	9.315 0.0 0.010			
										Vel =	0.57	
H.6 to T.27	135 135		0.0 1.03	1 0.862	Utr	2.0	12.000 2.000 14.000	150 0.0009	9.325 0.0 0.013			
										Vel =	0.57	
T.27			0.0 1.03						9.338	K Factor =	0.34	
*New Path												
T.25 to H.4	135 135		0.39 0.39	1 0.862	Utr	2.0	15.000 2.000 17.000	150 0.0002	9.341 0.0 0.003			
										Vel =	0.21	
H.4 to T.29	135 135		0.0 0.39	1 0.862	Utr	2.0	12.000 2.000 14.000	150 0.0001	9.344 0.0 0.002			
										Vel =	0.21	
T.29			0.0 0.39						9.346	K Factor =	0.13	

Final Calculations : Hazen-Williams

Uponor
NLV DEVELOPMENT - UNIT A1.1 - One Head Calculation (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	*****
*New Path												
T.41 to H.15	123 123		1.54	1	Utr	2.0	1.000 2.000 3.000	150	14.630 0.0			
H.15 to T.42	123 123		1.54	0.862			5.000 14.000 19.000	150	14.636 0.0	Vel =	0.85	
T.42 to T.39	123 123		-0.55	1	Utr Uel	2.0 11.0	8.000 14.000 22.000	150	14.673 0.0			
T.39 to T.36	123 123		0.99	0.862			0.0009	0.019	14.692 0.0	Vel =	0.54	
T.36 to H.13	123 123		0.0	1	Uel	11.0	1.000 12.000 13.000	150	14.692 0.0			
H.13 to T.37	123 123		0.99	0.862			3.000 3.000	150	14.704 0.0	Vel =	0.54	
T.37 to T.35	123 123		0.0	1	Uel Utr	11.0 2.0	1.000 14.000 15.000	150	14.706 0.0			
T.35 to H.12	123 123		0.99	0.862			0.0009	0.013	14.719 0.0	Vel =	0.54	
H.12 to T.32	123 123		0.0	1	Uel	11.0	1.000 12.000 13.000	150	14.719 0.0			
T.32 to H.11	123 123		0.99	0.862			10.000	150	14.731 0.0	Vel =	0.54	
H.11 to T.31	123 123		0.99	0.862			10.000	0.0008	0.008	Vel =	0.54	
T.31 to T.31	123 123		0.0	1	Utr	2.0	2.000 2.000 4.000	150	14.739 0.0			
T.31 to T.31	123 123		0.99	0.862			3.000 2.000 5.000	150	14.743 0.0	Vel =	0.43	
T.31 to T.31	123 123		0.78	0.862			1.000 2.000 3.000	150	14.746 0.0			
T.31 to T.31	123 123		0.78	0.862			0.0003	0.001	14.747	Vel =	0.43	
T.31 to T.31	123 123		0.0	0.78					14.747	K Factor =	0.20	
*New Path												
T.42 to T.43	123 123		0.55	1	Utr	2.0	6.000 2.000 8.000	150	14.673 0.0			
T.43 to H.17	123 123		0.55	0.862			8.000 2.000 10.000	150	14.676 0.0	Vel =	0.30	
H.17 to H.16	123 123		-0.13	1	Utr	2.0	8.000 2.000 10.000	150	14.676 0.0			
H.16 to T.40	123 123		0.42	0.862			13.000 13.000	150	14.677 0.0	Vel =	0.23	
T.40 to T.40	123 123		0.0	1	Utr	2.0	15.000 2.000 17.000	150	14.680 0.0			
T.40 to T.40	123 123		0.42	0.862			0.0002	0.003	14.680 0.0	Vel =	0.23	

Final Calculations : Hazen-Williams

Uponor
NLV DEVELOPMENT - UNIT A1.1 - One Head Calculation (H.3)

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Date 8/21/2023

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.40			0.0 0.42					14.683		K Factor = 0.11	
*New Path											
T.43 to T.44	123 123		0.12 0.12	1 0.862	2Utb 34.0	1.000 28.000 29.000	150 0	14.676 0.0 0.0		Vel = 0.07	
T.44			0.0 0.12					14.676		K Factor = 0.03	
*New Path											
T.38 to T.34	123 123		0.54 0.54	1 0.862	2Utb 34.0	11.000 28.000 39.000	150 0.0003	14.710 0.0 0.011		Vel = 0.30	
T.34			0.0 0.54					14.721		K Factor = 0.14	
*New Path											
T.32 to T.33	123 123		0.21 0.21	1 0.862	2Utb 34.0	2.000 28.000 30.000	150 0	14.743 0.0 0.001		Vel = 0.12	
T.33			0.0 0.21					14.744		K Factor = 0.05	
*New Path											
T.52 to H.21	110 110		0.94 0.94	1 0.862	Utr 2.0	6.000 2.000 8.000	150 0.0009	20.476 0.0 0.007		Vel = 0.52	
H.21 to H.22	110 110		0.0 0.94	1 0.862		10.000 10.000	150 0.0008	20.483 0.0 0.008		Vel = 0.52	
H.22 to H.23	110 110		0.0 0.94	1 0.862	Utr 2.0	10.000 2.000 12.000	150 0.0007	20.491 0.0 0.009		Vel = 0.52	
H.23 to H.20	110 110		0.0 0.94	1 0.862	Utr 2.0	10.000 2.000 12.000	150 0.0008	20.500 0.0 0.010		Vel = 0.52	
H.20 to H.19	110 110		0.0 0.94	1 0.862	Utr 2.0	10.000 2.000 12.000	150 0.0007	20.510 0.0 0.009		Vel = 0.52	
H.19 to T.51	110 110		0.0 0.94	1 0.862	Utb 17.0 Utr 2.0	2.000 16.000 18.000	150 0.0008	20.519 0.0 0.014		Vel = 0.52	
T.51			0.0 0.94					20.533		K Factor = 0.21	
*New Path											
T.46 to H.18	110 110		1.09 1.09	0.75 0.671	Utb 17.0 Utr 2.0	2.000 19.000 21.000	150 0.0035	20.797 0.0 0.073		Vel = 0.99	
H.18 to T.45	110 110		0.0 1.09	0.75 0.671	Utb 17.0	1.000 17.000 18.000	150 0.0036	20.870 0.0 0.064		Vel = 0.99	

Final Calculations : Hazen-Williams

Uponor
NLV DEVELOPMENT - UNIT A1.1 - One Head Calculation (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	*****
			0.0									
T.45			1.09						20.934	K Factor = 0.24		

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: 08/21/2023

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 A1.1 - Two Head Calculation (H.2 & H.1)
Drawing : RESIDENTIAL
Location : LONGVIEW & KESSLER LEES SUMMIT MO 6481
Remote Area : 1
Contract : 44424F 001
Data File : 44424F 001 NLV Development - Longview & Kessler - Fire, Unit
Date/Time : 08/21/2023 - 09:44 AM

HYDRAULIC DESIGN INFORMATION SHEET

Name - NLV DEVELOPMENT - UNIT A1.1 Date - 08/11/2023
Location - LEES SUMMIT MO 6481
Building - RESIDENTIAL System No. - 1
Contractor - S & B PLUMBING INC. Contract No. - 44424F 001
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 20.109 Psi Required 73.06 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 A1.1 - Two Head Calculation (H.2 & H.1)

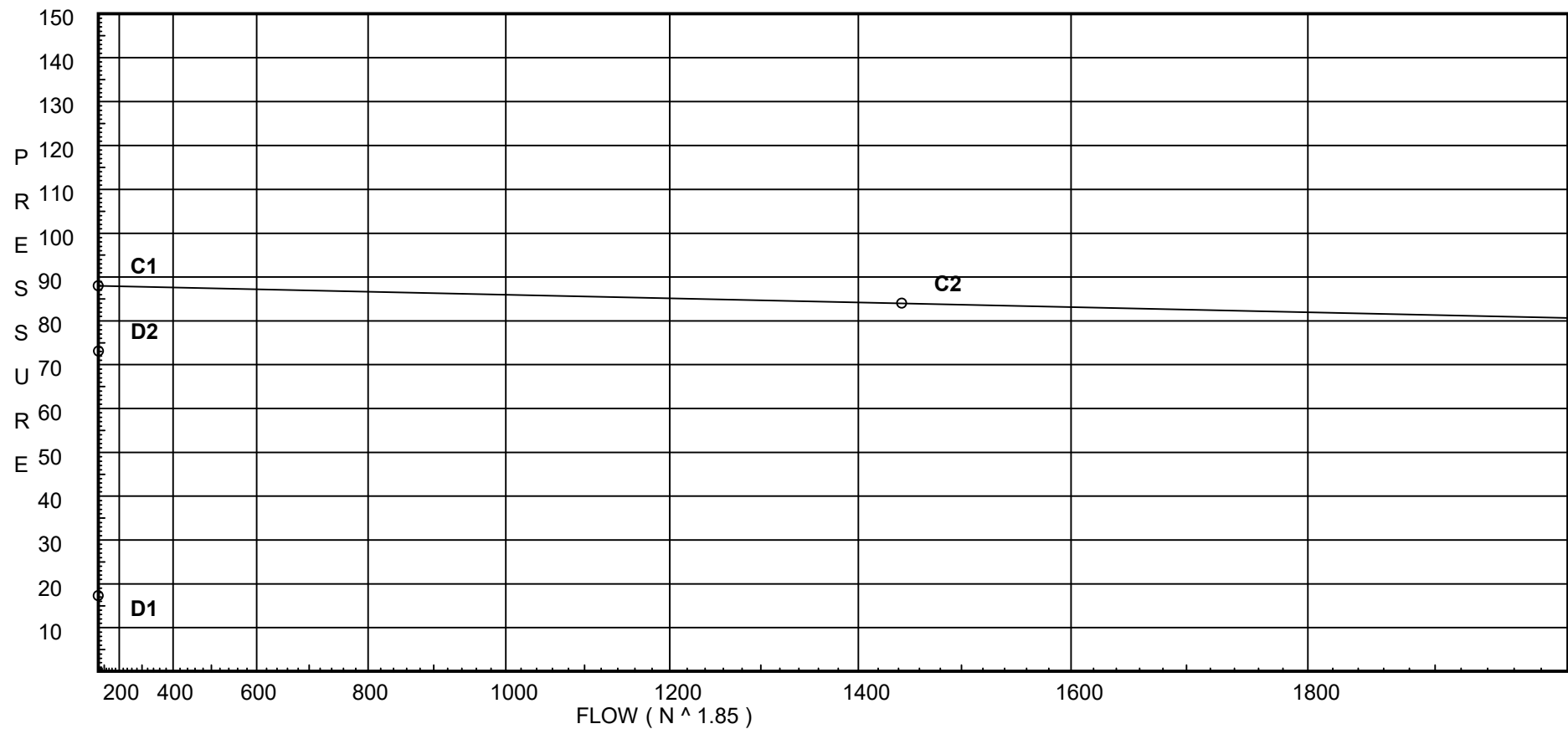
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City Water Supply:

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

Demand:

D1 - Elevation : 17.324
D2 - System Flow : 20.109
D2 - System Pressure : 73.055
Hose (Demand) :
D3 - System Demand : 20.109
Safety Margin : 14.944



Fittings Used Summary

Uponor
NLV DEVELOPMENT - UNIT A1.1 - Two Head Calculation (H.2 & H.1)

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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
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
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 A1.1 - Two Head Calculation (H.2 & H.1)

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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	20.11	73.055

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.2	135.0	3.7	7.3	10.0	0.05	196
T.24	135.0		7.58			
T.25	135.0		7.81			
T.33	123.0		13.74			
T.47	110.0		20.16			
T.46	110.0		20.67			
T.45	110.0		21.09			
S.1	108.0		22.67			
PRV	95.0		34.26			
UG	95.0		44.15			
MTR	95.0		66.45			
STR	95.0		73.06			
T.26	135.0		7.4			
H.3	135.0		7.53			
H.5	135.0		7.69			
T.28	135.0		7.78			
T.41	123.0		13.51			
H.14	123.0		13.54			
T.40	123.0		13.6			
T.38	123.0		13.65			
H.10	123.0		13.71			
T.31	123.0		13.75			
T.49	110.0		20.03			
T.48	110.0		20.11			
H.1	135.0	3.7	7.47	10.11	0.05	196
T.27	135.0		7.73			
T.34	123.0		13.66			
H.6	135.0		7.76			
H.7	135.0		7.78			
T.30	135.0		7.82			
H.9	135.0		7.87			
T.29	135.0		7.9			
T.44	123.0		13.58			
T.52	110.0		19.7			
T.51	110.0		19.87			
T.50	110.0		20.0			
H.8	135.0		7.79			
H.4	135.0		7.86			
H.15	123.0		13.52			
T.42	123.0		13.58			
T.39	123.0		13.62			
T.36	123.0		13.65			

Flow Summary - NFPA

Uponor
NLV DEVELOPMENT - UNIT A1.1 - Two Head Calculation (H.2 & 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>
H.13	123.0		13.65		
T.37	123.0		13.68		
T.35	123.0		13.71		
H.12	123.0		13.73		
T.32	123.0		13.74		
H.11	123.0		13.75		
T.43	123.0		13.58		
H.17	123.0		13.58		
H.16	123.0		13.59		
H.21	110.0		19.72		
H.22	110.0		19.75		
H.23	110.0		19.77		
H.20	110.0		19.8		
H.19	110.0		19.83		
H.18	110.0		20.9		

Final Calculations : Hazen-Williams

Uponor
NLV DEVELOPMENT - UNIT A1.1 - Two Head Calculation (H.2 & 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	*****
*Remote Head to Supply												
H.2 to T.24	135	3.70	4.68	1	Utb Utr	17.0 2.0	2.000 16.000	150	7.300 0.0			
T.24	135		4.68	0.862			18.000	0.0153	0.275	Vel =	2.57	
T.24	135		3.08	1	Utr	2.0	4.000	150	7.575			
T.25	135		7.76	0.862			6.000	0.0388	0.233	Vel =	4.27	
T.25	135		-1.93	1	Utr Utb	2.0 17.0	16.000 16.000	150	7.808 5.197			
T.33	123		5.83	0.862			32.000	0.0229	0.733	Vel =	3.21	
T.33	123		-0.04	1	Utb	17.0	21.000	150	13.738			
T.47	110		5.79	0.862			14.000		5.630			
T.47	110		14.32	1.25	Utr	4.0	35.000	0.0226	0.792	Vel =	3.18	
T.46	110		20.11	1.054			2.000	150	20.160			
T.46	110		-2.01	1.25	Utr	4.0	4.000	0.0850	0.510	Vel =	7.39	
T.45	110		18.1	1.054			6.000		0.0			
T.45	110		2.01	1.25	T	2.44	6.000	0.0700	0.420	Vel =	6.66	
S.1	108		20.11	1.054			2.440		0.866			
S.1	108		0.0	1.25	E	1.22	8.440	0.0851	0.718	Vel =	7.39	
PRV	95		20.11	1.054			10.000	150	22.674			
PRV	95		0.0	0.75	E	1.414	1.220		10.630	* * Fixed Loss = 5		
UG	95		20.11	0.705			11.220	0.0850	0.954	Vel =	7.39	
UG	95		0.0	0.75			15.000	150	34.258			
MTR	95		20.11	0.745			1.414		0.0			
MTR	95		0.0	0.75			16.414	0.6025	9.889	Vel =	16.53	
STR	95		20.11	0.745			5.000	150	44.147			
STR	95		0.0	0.75			5.000		20.000	* * Fixed Loss = 20		
STR	95		20.11	0.745			10.000	0.4606	2.303	Vel =	14.80	
STR	95		0.0	0.75			10.000	150	66.450			
STR	95		20.11	0.745			10.000		2.000	* * Fixed Loss = 2		
STR	95		20.11	0.745			10.000	0.4605	4.605	Vel =	14.80	
STR			0.0									
STR			20.11						73.055	K Factor =	2.35	
*New Path												
H.2	135		5.31	1	Utr	2.0	3.000	150	7.300			
T.26	135		5.31	0.862			2.000		0.0			
T.26	135		0.0	1	Utr	2.0	5.000	0.0192	0.096	Vel =	2.92	
H.3	135		5.31	0.862			2.000		0.0			
H.3	135		0.0	1	Utr	2.0	7.000	0.0194	0.136	Vel =	2.92	
H.5	135		5.31	0.862			6.000	150	7.532			
H.5	135		0.0	1	Utr	2.0	2.000		0.0			
H.5	135		5.31	0.862			8.000	0.0192	0.154	Vel =	2.92	
H.5	135		0.0	1	Utr	2.0	3.000	150	7.686			
T.28	135		5.31	0.862			2.000		0.0			
T.28	135		5.31	0.862			5.000	0.0192	0.096	Vel =	2.92	

Final Calculations : Hazen-Williams

Uponor
NLV DEVELOPMENT - UNIT A1.1 - Two Head Calculation (H.2 & 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.28 to T.41	135 123		-1.21 4.1	1 0.862	2Utb 34.0	16.000 28.000 44.000	150 0.0120	7.782 5.197 0.527			
T.41 to H.14	123 123		-2.01 2.09	1 0.862		9.000 9.000	150 0.0034	13.506 0.0 0.031		Vel =	2.25
H.14 to T.40	123 123		0.0 2.09	1 0.862	Utb 17.0 Utr 2.0	2.000 16.000 18.000	150 0.0034	13.537 0.0 0.061		Vel =	1.15
T.40 to T.38	123 123		0.73 2.82	1 0.862	Utr 2.0	7.000 2.000 9.000	150 0.0060	13.598 0.0 0.054		Vel =	1.55
T.38 to H.10	123 123		-0.36 2.46	1 0.862	Utr 2.0	10.000 2.000 12.000	150 0.0047	13.652 0.0 0.056		Vel =	1.35
H.10 to T.31	123 123		0.0 2.46	1 0.862	Utr 2.0	8.000 2.000 10.000	150 0.0046	13.708 0.0 0.046		Vel =	1.35
T.31 to T.49	123 110		1.59 4.05	1 0.862	2Utb 34.0	27.000 28.000 55.000	150 0.0117	13.754 5.630 0.643		Vel =	2.23
T.49 to T.48	110 110		4.51 8.56	1.25 1.054	Utr 4.0	1.000 4.000 5.000	150 0.0176	20.027 0.0 0.088		Vel =	3.15
T.48 to T.47	110 110		5.76 14.32	1.25 1.054		1.000 1.000	150 0.0450	20.115 0.0 0.045		Vel =	5.27
T.47			0.0 14.32					20.160		K Factor =	3.19
*New Path											
T.24 to H.1	135 135		-3.08 -3.08	1 0.862	Utr 2.0	13.000 2.000 15.000	150 -0.0071	7.575 0.0 -0.106		Vel =	1.69
H.1 to T.27	135 135	3.70	10.11 7.03	1 0.862	Utr 2.0	6.000 2.000 8.000	150 0.0325	7.469 0.0 0.260		Vel =	3.86
T.27 to T.34	135 123		-1.64 5.39	1 0.862	Utr 2.0 Utb 17.0	21.000 16.000 37.000	150 0.0198	7.729 5.197 0.732		Vel =	2.96
T.34 to T.48	123 110		0.36 5.75	1 0.862	Utb 17.0	23.000 14.000 37.000	150 0.0224	13.658 5.630 0.827		Vel =	3.16
T.48			0.0 5.75					20.115		K Factor =	1.28
*New Path											
T.27 to H.6	135 135		1.65 1.65	1 0.862	Utr 2.0	12.000 2.000 14.000	150 0.0022	7.729 0.0 0.031		Vel =	0.91

Final Calculations : Hazen-Williams

Uponor
NLV DEVELOPMENT - UNIT A1.1 - Two Head Calculation (H.2 & 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.6 to H.7	135 135		0.0 1.65	1 0.862	Utr	2.0	9.000 2.000 11.000	150 0.0022	7.760 0.0 0.024		Vel = 0.91	
H.7 to T.30	135 135		0.0 1.65	1 0.862	Utr	2.0	12.000 2.000 14.000	150 0.0022	7.784 0.0 0.031		Vel = 0.91	
T.30 to H.9	135 135		1.21 2.86	1 0.862			9.000 9.000	150 0.0061	7.815 0.0 0.055		Vel = 1.57	
H.9 to T.29	135 135		0.0 2.86	1 0.862	Utr	2.0	3.000 2.000 5.000	150 0.0062	7.870 0.0 0.031		Vel = 1.57	
T.29 to T.44	135 123		1.93 4.79	1 0.862	Utr Utb	2.0 17.0	14.000 16.000 30.000	150 0.0159	7.901 5.197 0.478		Vel = 2.63	
T.44 to T.52	123 110		-0.28 4.51	1 0.862	Utb	17.0	21.000 14.000 35.000	150 0.0143	13.576 5.630 0.499		Vel = 2.48	
T.52 to T.51	110 110		-1.69 2.82	1 0.862	Utr Utb	2.0 17.0	12.000 16.000 28.000	150 0.0060	19.705 0.0 0.167		Vel = 1.55	
T.51 to T.50	110 110		1.69 4.51	1.25 1.054	Uel	11.0	12.000 11.000 23.000	150 0.0053	19.872 0.0 0.123		Vel = 1.66	
T.50 to T.49	110 110		0.0 4.51	1.25 1.054	Utr	4.0	2.000 4.000 6.000	150 0.0053	19.995 0.0 0.032		Vel = 1.66	
T.49			0.0 4.51						20.027		K Factor = 1.01	
*New Path												
T.28 to H.8	135 135		1.21 1.21	1 0.862	Utr	2.0	7.000 2.000 9.000	150 0.0013	7.782 0.0 0.012		Vel = 0.67	
H.8 to T.30	135 135		0.0 1.21	1 0.862	Utb	17.0	3.000 14.000 17.000	150 0.0012	7.794 0.0 0.021		Vel = 0.67	
T.30			0.0 1.21						7.815		K Factor = 0.43	
*New Path												
T.25 to H.4	135 135		1.94 1.94	1 0.862	Utr	2.0	15.000 2.000 17.000	150 0.0030	7.808 0.0 0.051		Vel = 1.07	
H.4 to T.29	135 135		0.0 1.94	1 0.862	Utr	2.0	12.000 2.000 14.000	150 0.0030	7.859 0.0 0.042		Vel = 1.07	
T.29			0.0 1.94						7.901		K Factor = 0.69	

Final Calculations : Hazen-Williams

Uponor
NLV DEVELOPMENT - UNIT A1.1 - Two Head Calculation (H.2 & 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.41 to H.15	123 123		2.02	1	Utr	2.0	1.000 2.000 3.000	150	13.506 0.0			
H.15 to T.42	123 123		2.02	0.862			3.000	0.0033	0.010	Vel =	1.11	
H.15 to T.42	123 123		0.0	1	Utb	17.0	5.000 14.000 19.000	150	13.516 0.0			
T.42 to T.39	123 123		2.02	0.862			19.000	0.0032	0.061	Vel =	1.11	
T.42 to T.39	123 123		-0.46	1	Utr Uel	2.0 11.0	8.000 14.000 22.000	150	13.577 0.0			
T.39 to T.36	123 123		1.56	0.862			22.000	0.0020	0.044	Vel =	0.86	
T.39 to T.36	123 123		0.0	1	Uel	11.0	1.000 12.000 13.000	150	13.621 0.0			
T.36 to H.13	123 123		1.56	0.862			13.000	0.0020	0.026	Vel =	0.86	
T.36 to H.13	123 123		0.0	1			3.000	150	13.647 0.0			
H.13 to T.37	123 123		1.56	0.862			3.000	0.0020	0.006	Vel =	0.86	
H.13 to T.37	123 123		0.0	1	Uel Utr	11.0 2.0	1.000 14.000 15.000	150	13.653 0.0			
T.37 to T.35	123 123		1.56	0.862			15.000	0.0020	0.030	Vel =	0.86	
T.37 to T.35	123 123		0.0	1	Uel	11.0	1.000 12.000 13.000	150	13.683 0.0			
T.35 to H.12	123 123		1.56	0.862			13.000	0.0020	0.026	Vel =	0.86	
T.35 to H.12	123 123		0.0	1			10.000	150	13.709 0.0			
H.12 to T.32	123 123		1.56	0.862			10.000	0.0021	0.021	Vel =	0.86	
H.12 to T.32	123 123		0.0	1	Utr	2.0	2.000 2.000 4.000	150	13.730 0.0			
T.32 to H.11	123 123		1.56	0.862			4.000	0.0020	0.008	Vel =	0.86	
T.32 to H.11	123 123		0.04	1	Utr	2.0	3.000 2.000 5.000	150	13.738 0.0			
H.11 to T.31	123 123		1.6	0.862			5.000	0.0020	0.010	Vel =	0.88	
H.11 to T.31	123 123		0.0	1	Utr	2.0	1.000 2.000 3.000	150	13.748 0.0			
T.31			1.6	0.862			3.000	0.0020	0.006	Vel =	0.88	
T.31			0.0						13.754	K Factor =	0.43	
*New Path												
T.44 to T.43	123 123		0.28	1	2Utb	34.0	1.000 28.000 29.000	150	13.576 0.0			
T.43 to H.17	123 123		0.28	0.862			29.000	0.0001	0.002	Vel =	0.15	
T.43 to H.17	123 123		0.46	1	Utr	2.0	8.000 2.000 10.000	150	13.578 0.0			
H.17 to H.16	123 123		0.74	0.862			10.000	0.0006	0.006	Vel =	0.41	
H.17 to H.16	123 123		0.0	1			13.000	150	13.584 0.0			
H.16 to T.40	123 123		0.74	0.862			13.000	0.0005	0.006	Vel =	0.41	
H.16 to T.40	123 123		0.0	1	Utr	2.0	15.000 2.000 17.000	150	13.590 0.0			
T.40			0.74	0.862			17.000	0.0005	0.008	Vel =	0.41	

Final Calculations : Hazen-Williams

Uponor
NLV DEVELOPMENT - UNIT A1.1 - Two Head Calculation (H.2 & H.1)

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Date 8/21/2023

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.40			0.0 0.74					13.598		K Factor = 0.20	
*New Path											
T.42 to T.43	123 123		0.45 0.45	1 0.862	Utr 2.0	6.000 2.000 8.000	150 0.0001	13.577 0.0 0.001		Vel = 0.25	
T.43			0.0 0.45					13.578		K Factor = 0.12	
*New Path											
T.38 to T.34	123 123		0.37 0.37	1 0.862	2Utb 34.0	11.000 28.000 39.000	150 0.0002	13.652 0.0 0.006		Vel = 0.20	
T.34			0.0 0.37					13.658		K Factor = 0.10	
*New Path											
T.33 to T.32	123 123		0.03 0.03	1 0.862	2Utb 34.0	2.000 28.000 30.000	150 0	13.738 0.0 0.0		Vel = 0.02	
T.32			0.0 0.03					13.738		K Factor = 0.01	
*New Path											
T.52 to H.21	110 110		1.69 1.69	1 0.862	Utr 2.0	6.000 2.000 8.000	150 0.0024	19.705 0.0 0.019		Vel = 0.93	
H.21 to H.22	110 110		0.0 1.69	1 0.862		10.000 10.000	150 0.0023	19.724 0.0 0.023		Vel = 0.93	
H.22 to H.23	110 110		0.0 1.69	1 0.862	Utr 2.0	10.000 2.000 12.000	150 0.0023	19.747 0.0 0.028		Vel = 0.93	
H.23 to H.20	110 110		0.0 1.69	1 0.862	Utr 2.0	10.000 2.000 12.000	150 0.0022	19.775 0.0 0.027		Vel = 0.93	
H.20 to H.19	110 110		0.0 1.69	1 0.862	Utr 2.0	10.000 2.000 12.000	150 0.0023	19.802 0.0 0.028		Vel = 0.93	
H.19 to T.51	110 110		0.0 1.69	1 0.862	Utb 17.0 Utr 2.0	2.000 16.000 18.000	150 0.0023	19.830 0.0 0.042		Vel = 0.93	
T.51			0.0 1.69					19.872		K Factor = 0.38	
*New Path											
T.46 to H.18	110 110		2.00 2.0	0.75 0.671	Utb 17.0 Utr 2.0	2.000 19.000 21.000	150 0.0108	20.670 0.0 0.226		Vel = 1.81	
H.18 to T.45	110 110		0.0 2.0	0.75 0.671	Utb 17.0	1.000 17.000 18.000	150 0.0108	20.896 0.0 0.194		Vel = 1.81	

Final Calculations : Hazen-Williams

Uponor
NLV DEVELOPMENT - UNIT A1.1 - Two Head Calculation (H.2 & H.1)

Page 11
Date 8/21/2023

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	*****
			0.0									
T.45			2.00						21.090	K Factor = 0.44		

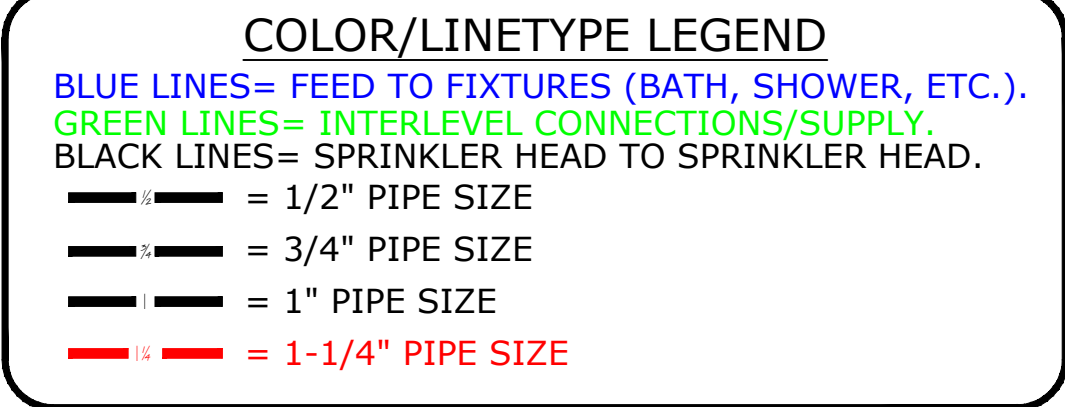
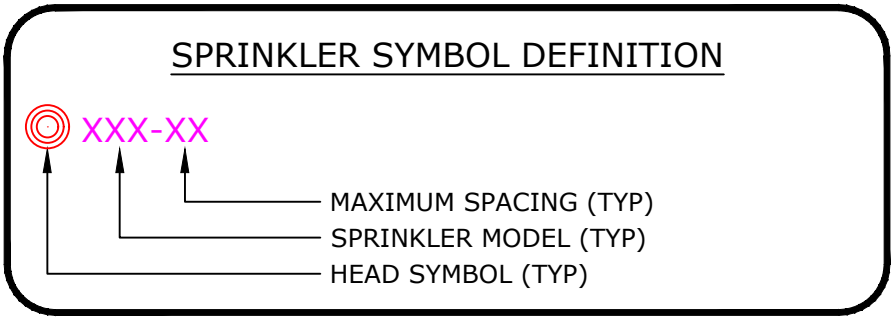
C:\Users\tim.mcdonald\OneDrive - Uponor Corporation\General\4424 NLV Development-Longview & Kessler\4424F 002 Unit B1.1\Uponor-Drawing & Calcul\4424F 002 NLV Development - Longview & Kessler - Fire, Unit B1.1.dwg 08/14/23 - 2:29 pm

Markup Legend	
Delete Line	
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Add Tee	
Add Elbow	
Add Coupling	
Add Head	
Delete Head	
Move Head	
Note: All revisions must be reviewed by Uponor	

Table F002-1
Multipurpose Fire Safety Systems
The Uponor Residential Fire Safety System is a residential fire protections 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).

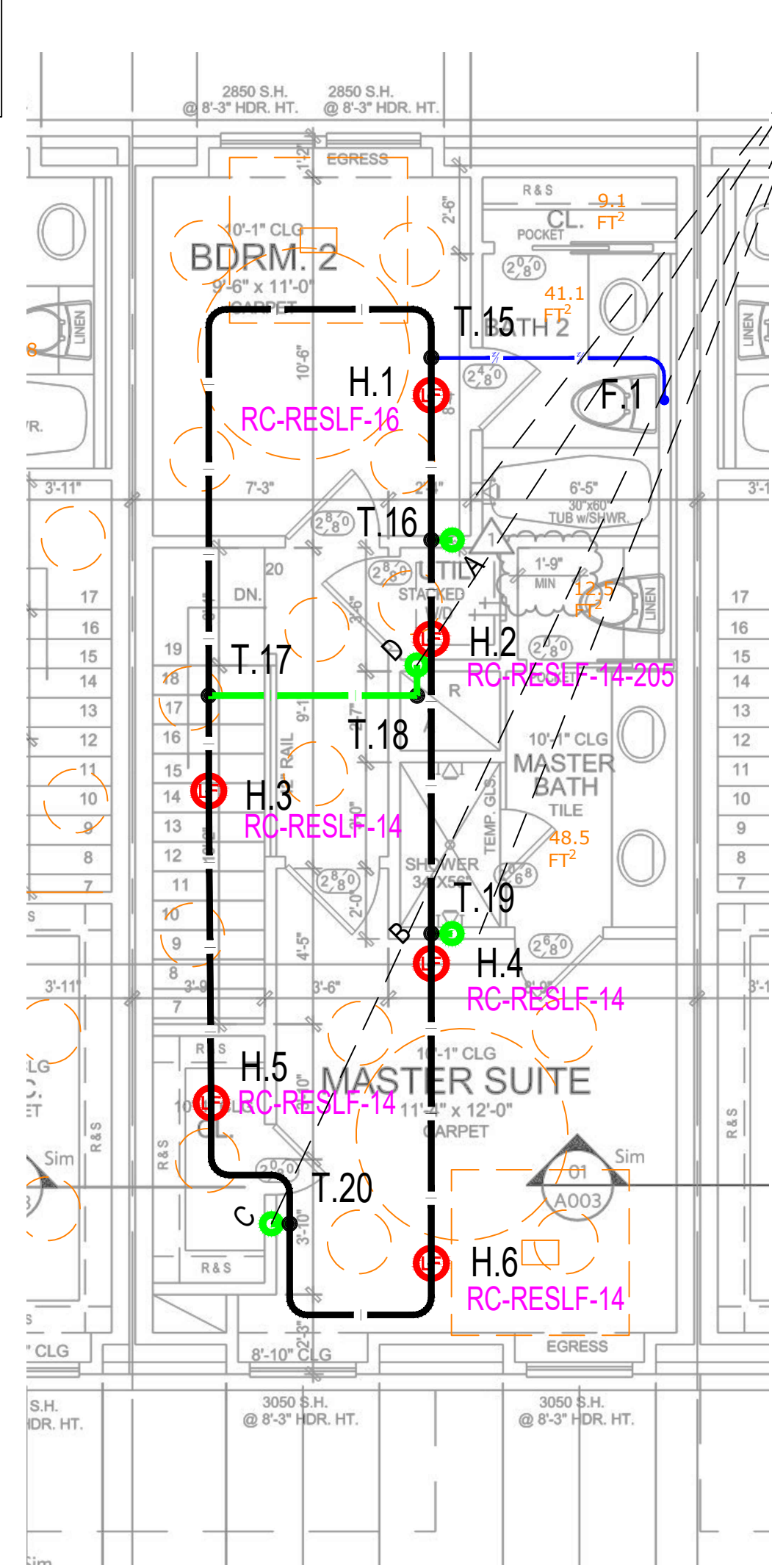
MOST HYDRAULICALLY REMOTE HEADS			
	HEAD #	GPM	PRESSURE REQ'D AT STREET
1 HEAD	H.1	14	69.88
2 HEAD	H.6 & H.4	20.0005	73.1



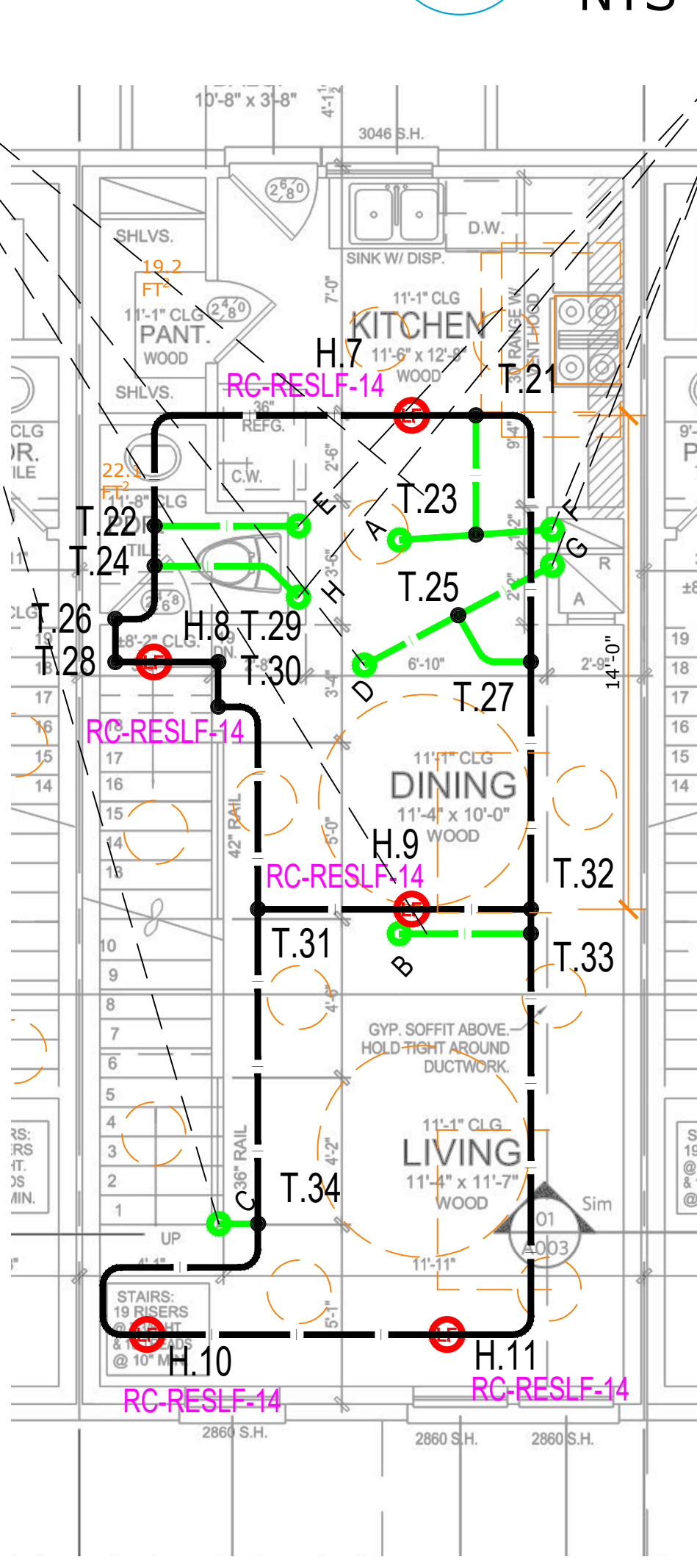
- Ⓡ RC-RESLF-16 - - - 3 SENJU Model RC-RESLF37 LowFlow K3.7 Residential Concealed Pendent SS8261 K=3.7, 162F°, 7/16" Orifice, Maximum Spacing 16"x16" Sprinkler head demand: 14 gpm @ 14.3
- Ⓡ RC-RESLF-14-205 - - - 2 SENJU Model RC-RESLFIT LowFlow K3.7 Residential Concealed Pendent SS8261 K=3.7, 205F°, 7/16" Orifice, Maximum Spacing 14"x14" Sprinkler head demand: 11 gpm @ 8.8
- Ⓡ RC-RESLF-14 - - - 9 SENJU Model RC-RESLF37 LowFlow K3.7 Residential Concealed Pendent SS8261 K=3.7, 162F°, 7/16" Orifice, Maximum Spacing 14"x14" Sprinkler head demand: 10 gpm @ 7.3

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.

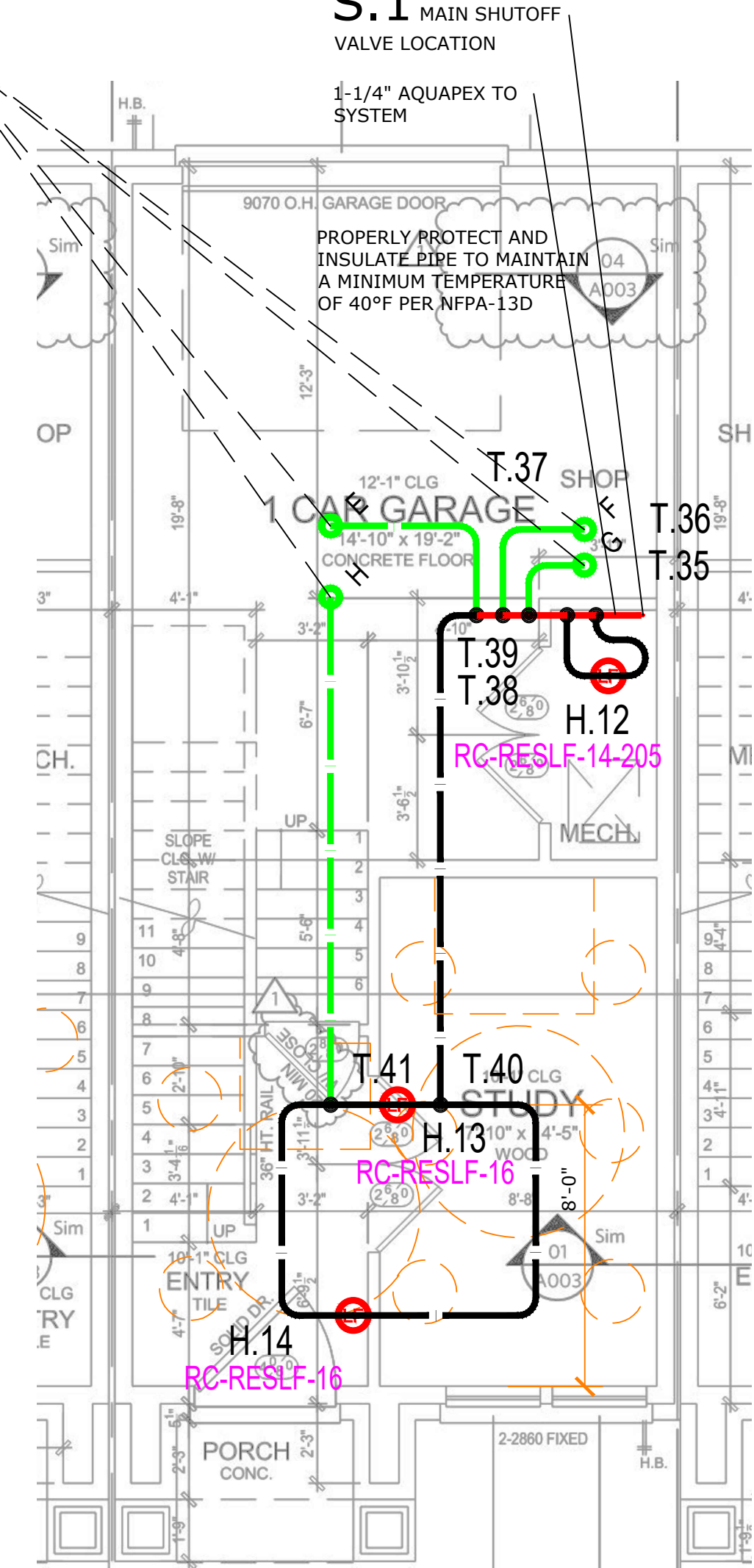
LOW FLOW SPRINKLERS SPACED AT 16"x16"
8'-0" MAXIMUM FROM WALLS.



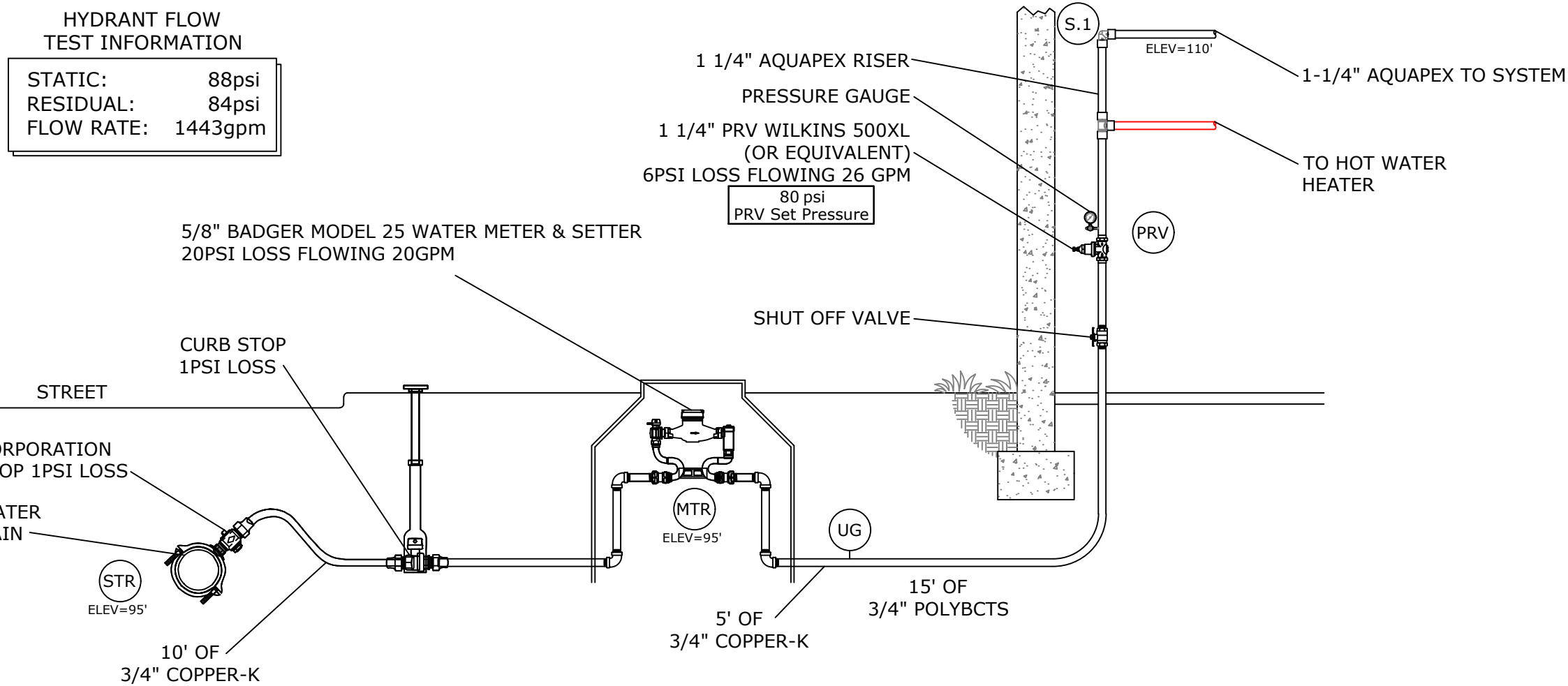
3
F100
THIRD FLOOR
1/4" = 1'-0"



2
F100
SECOND FLOOR
1/4" = 1'-0"



1
F100
FIRST FLOOR
1/4" = 1'-0"



4
F100
WATER SERVICE DETAIL
NTS

S.1 MAIN SHUTOFF
VALVE LOCATION
1-1/4" AQUAPEX TO
SYSTEM
PROPERLY PROTECT AND
INSULATE PIPE TO MAINTAIN
A MINIMUM TEMPERATURE
OF 40°F PER NFPA-13D

uponor

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(888) 594-7726 (952) 979-7311
DESIGN SERVICES@UPONOR.COM
WWW.UPONOR-USA.COM

SALES REP:

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: 08/21/2023
NICET Certification No. 150393
Water-Based Systems Layout - Level III
Certification Expires: June 1, 2025

NLV DEVELOPMENT - UNIT B1.1
LONGVIEW & KESSLER
LEES SUMMIT, MO 6481

COMPANY: S & B PLUMBING INC.	
PROJECT NUMBER: 44424E 002	CONTACT: MIKE STOREY
DRAWN BY: TIM McDONALD	CONTACT PH. NUMBER: 913.681.3075
CHECKED BY: BRENT KOTULA	ALLIANCE ID: 3017
CERTIFICATION LEVEL: SET IV	PLOT DATE: 08/11/2023
CERTIFICATION NUMBER: 113889	SHEET SCALE: 1/4" = 1'-0"
SQUARE FEET: 1146 SQ. FT.	REVISIONS
NO.	DATE
	DESCRIPTION

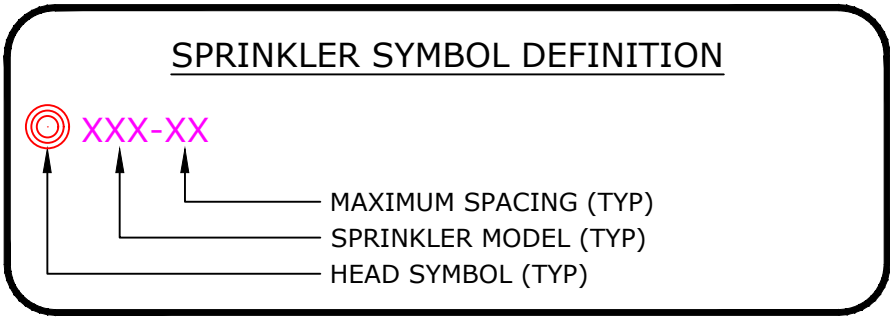
SHEET DESCRIPTION
ALL FLOORS

SHEET NUMBER

F100

© UPONOR - CONFIDENTIAL

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Add Tee	
Add Elbow	
Add Coupling	
Add Head	
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Move Head	
Note: All revisions must be reviewed by Uponor	

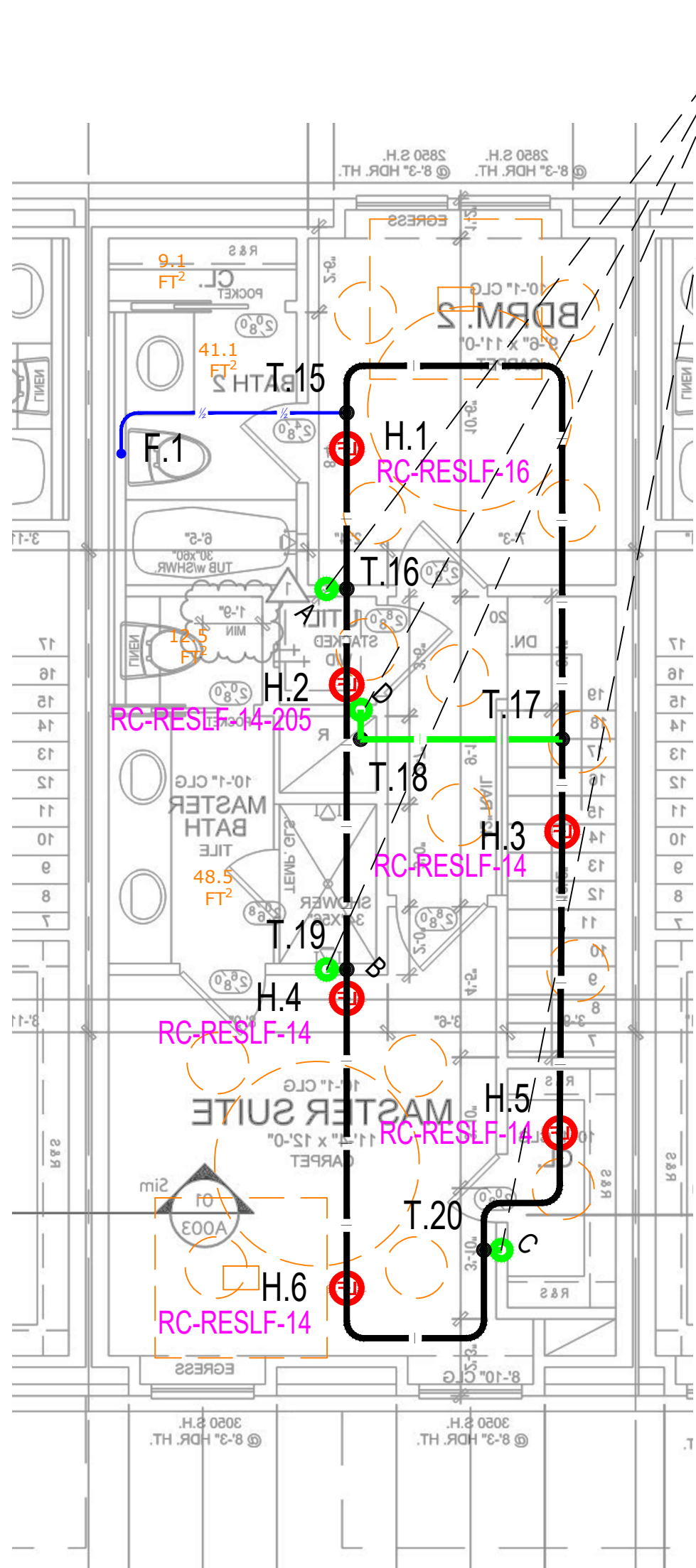


COLOR/LINETYPE LEGEND

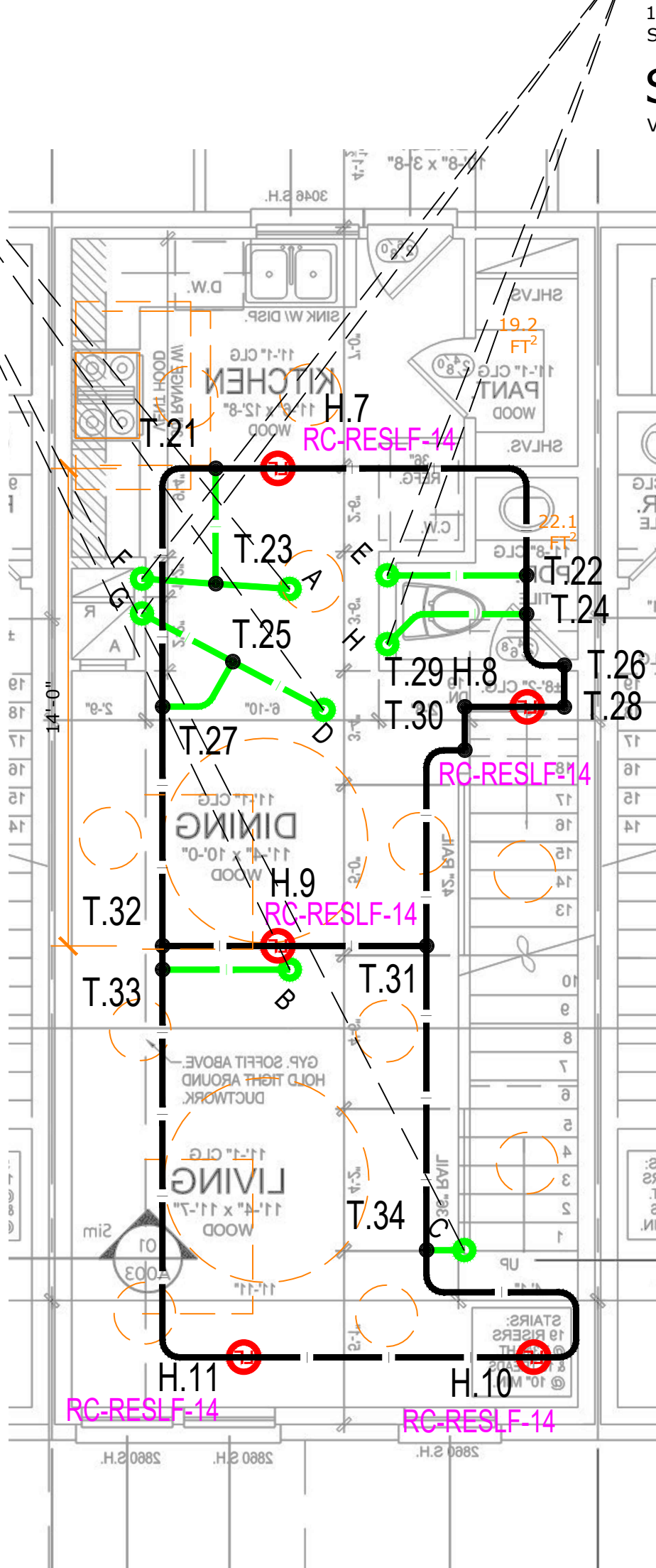
BLUE LINES=	FEED TO FIXTURES (BATH, SHOWER, ETC.).
GREEN LINES=	INTERLEVEL CONNECTIONS/SUPPLY.
BLACK LINES=	SPRINKLER HEAD TO SPRINKLER HEAD.
	= 1/2" PIPE SIZE
	= 3/4" PIPE SIZE
	= 1" PIPE SIZE
	= 1-1/4" PIPE SIZE

Multipurpose Fire Safety Systems
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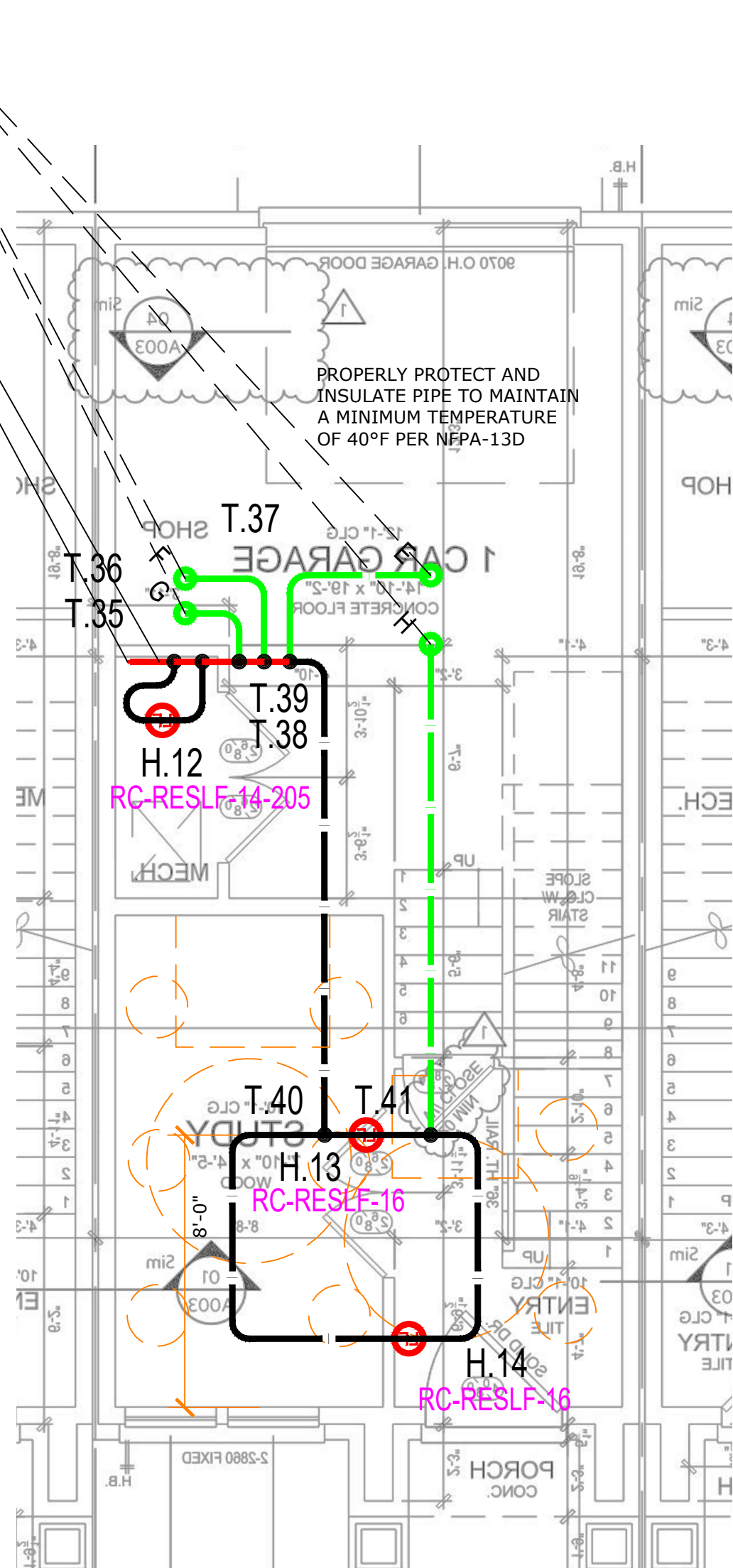
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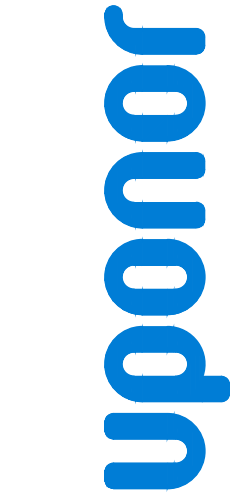
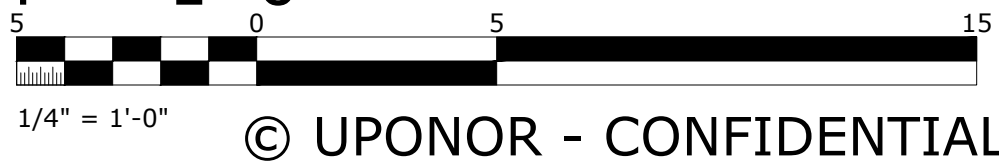
3
F101
THIRD FLOOR
1/4" = 1'-0"



2
F101
SECOND FLOOR
1/4" = 1'-0"



1
F101
FIRST FLOOR
1/4" = 1'-0"



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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 W McDonald Date: 08/21/2023
NICET Certification No. 150393
Water-Based Systems Layout - Level III
Certification Expires: June 1, 2025

NLV DEVELOPMENT - UNIT B1.1
LONGVIEW & KESSLER
LEES SUMMIT, MO 6481

SHEET DESCRIPTION
ALL FLOORS MIRROR

SHEET NUMBER

F101

DESIGN SERVICES
5925 148th Street West, Apple Valley, MN 55124
888.594.7726 (Toll Free) or 952.897.7311
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WEB: WWW.UPONOR-USA.COM

AquaSAFE™ GENERAL NOTES:

1. 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 SYSTEM FOR THIS HOME SUPPLIES FIRE SPRINKLERS THAT REQUIRE CERTAIN FLOWS AND PRESSURES TO FIGHT 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 REVIEW OF THE FIRE SPRINKLER SYSTEM BY A FIRE PROTECTION SPECIALIST. **DO NOT REMOVE THIS SIGN**".

10. ALL INTERIOR PIPING TO BE UPONOR "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 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. NFPA 13D 8.2.5* OBSTRUCTIONS TO RESIDENTIAL SPRINKLERS
 - 8.2.5.7* SHADOW AREAS SHALL BE PERMITTED IN THE PROTECTION AREA OF A SPRINKLER AS LONG AS THE CUMULATIVE DRY AREAS DO NOT EXCEED 15 FT² PER SPRINKLER.
 - 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 FT² (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 PRIMARY 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. 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 220, STANDARD 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 ROOMS, 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 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 AT 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 CLOSETS IN GARAGES AND EXTERIOR CLOSETS (REGARDLESS OF SIZE) LOCATED ON EXTERIOR BALCONIES, EXTERIOR BREEZEWAYS/CORRIDORS, OR ACCESSED 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.
 - A.9.1.1 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. CONSULTATION WITH THE GENERAL CONTRACTOR AND/OR OWNER IS RECOMMENDED TO ENSURE PROPER METHODS AND MATERIALS ARE USED TO MAKE SURE 40°F WILL BE MAINTAINED.

Senju RC-RES: Open Web Truss/TJI Construction

Senju RC-RES: Traditional Wood Framing Construction

Insulation Recommendations

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).

Extreme Temperature Installations

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.

Bending PEX Tubing

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"

High Upstream Pressure

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.

See General Notes 8.2.5.8 for Architectural Feature Requirements

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.**

NFPA 13D Table 7.5.6.3 Distances From Heat Sources

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 Flues	18"	9"
Uninsulated Heat Ducts	18"	9"
Uninsulated Hot Water Pipes	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"

Tubing Support Spacing:

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

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

In-line Flow Test

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**).

Flow Test

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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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: 08/21/2023
NICET Certification No. 150393
Water-Based Systems Layout - Level III
Certification Expires: June 1, 2025

NLV DEVELOPMENT - UNIT B1.1
LONGVIEW & KESSLER
LEES SUMMIT, MO 6481

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: 08/21/2023

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 B1.1 - One Head Calculation (H.1)
Drawing : RESIDENTIAL
Location : LONGVIEW & KESSLER LEES SUMMIT MO 6481
Remote Area : 1
Contract : 44424F 002
Data File : 44424F 002 NLV Development - Longview & Kessler - Fire, Unit
Date/Time : 08/14/2023 - 02:34 PM

HYDRAULIC DESIGN INFORMATION SHEET

Name - NLV DEVELOPMENT - UNIT B1.1 Date - 08/11/2023
Location - LEES SUMMIT MO 6481
Building - RESIDENTIAL System No. - 1
Contractor - S & B PLUMBING INC. Contract No. - 44424F 002
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 69.88 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 B1.1 - One Head Calculation (H.1)

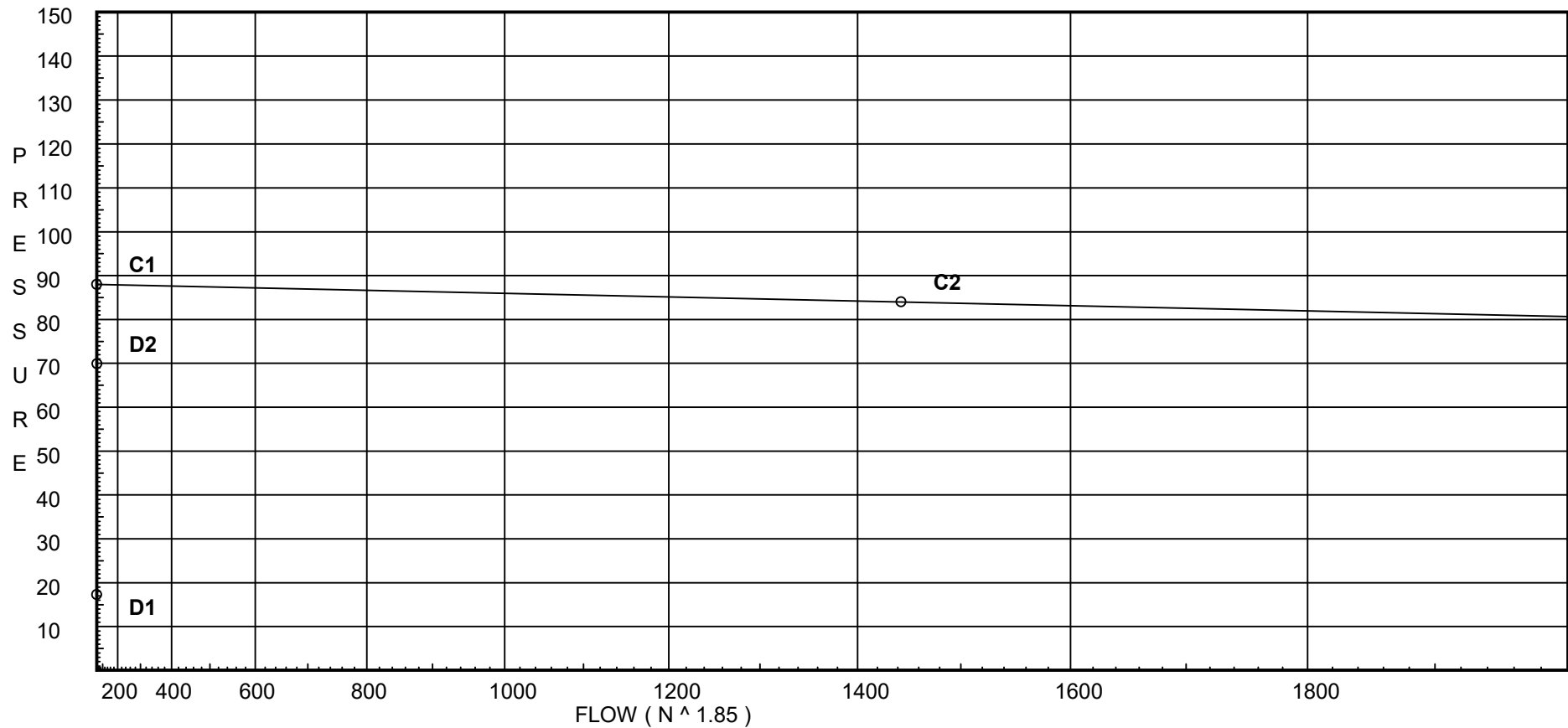
Page 2
Date 8/14/2023

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 : 69.883
Hose (Demand) :
D3 - System Demand : 13.992
Safety Margin : 18.116



Fittings Used Summary

Uponor
NLV DEVELOPMENT - UNIT B1.1 - One Head Calculation (H.1)

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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
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
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 B1.1 - One Head Calculation (H.1)

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Date 8/14/2023

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	69.883

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.16	135.0		14.63			
T.23	123.0		20.38			
T.38	110.0		26.49			
T.37	110.0		26.51			
T.36	110.0		26.73			
T.35	110.0		26.77			
S.1	108.0		28.18			
PRV	95.0		39.3			
UG	95.0		44.35			
MTR	95.0		65.53			
STR	95.0		69.88			
T.15	135.0		14.36			
T.17	135.0		14.73			
T.18	135.0		15.02			
T.25	123.0		20.38			
H.2	135.0		14.68			
T.19	135.0		14.78			
T.33	123.0		20.24			
T.32	123.0		20.27			
T.27	123.0		20.35			
T.21	123.0		20.4			
H.7	123.0		20.42			
T.22	123.0		20.5			
T.39	110.0		26.46			
H.3	135.0		14.74			
H.5	135.0		14.78			
T.20	135.0		14.8			
T.34	123.0		20.23			
T.31	123.0		20.27			
T.30	123.0		20.34			
T.29	123.0		20.39			
H.8	123.0		20.4			
T.28	123.0		20.45			
T.26	123.0		20.49			
T.24	123.0		20.5			
T.41	110.0		26.34			
H.13	110.0		26.35			
T.40	110.0		26.35			
H.4	135.0		14.79			
H.6	135.0		14.79			
H.10	123.0		20.23			

Flow Summary - NFPA

Uponor
NLV DEVELOPMENT - UNIT B1.1 - One Head Calculation (H.1)

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Date 8/14/2023

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.11	123.0		20.23		
H.9	123.0		20.27		
H.14	110.0		26.35		
H.12	110.0		26.75		

Final Calculations : Hazen-Williams

Uponor
NLV DEVELOPMENT - UNIT B1.1 - One Head Calculation (H.1)

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Date 8/14/2023

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	*****	
*Remote Head to Supply													
H.1 to T.16	135	3.70	8.64	1	Utr	2.0	5.000 2.000 7.000	150	14.300 0.0				
	135		8.64	0.862				0.0474	0.332	Vel =	4.75		
T.16 to T.23	135		-3.63	1	Utr Utb	2.0 17.0	16.000 16.000 32.000	150	14.632 5.197				
	123		5.01	0.862				0.0173	0.555	Vel =	2.75		
T.23 to T.38	123		-0.60	1	Utb	17.0	21.000 14.000 35.000	150	20.384 5.630				
	110		4.41	0.862				0.0137	0.479	Vel =	2.42		
T.38 to T.37	110		4.99	1.25			1.000	150	26.493 0.0				
	110		9.4	1.054			1.000	0.0210	0.021	Vel =	3.46		
T.37 to T.36	110		4.59	1.25	Utr	4.0	1.000 4.000 5.000	150	26.514 0.0				
	110		13.99	1.054				0.0434	0.217	Vel =	5.14		
T.36 to T.35	110		-0.55	1.25			1.000	150	26.731 0.0				
	110		13.44	1.054			1.000	0.0410	0.041	Vel =	4.94		
T.35 to S.1	110		0.55	1.25	Utr T	4.0 2.44	6.000 6.440 12.440	150	26.772 0.866				
	108		13.99	1.054				0.0434	0.540	Vel =	5.14		
S.1 to PRV	108		0.0	1.25	E	1.22	10.000 1.220 11.220	150	28.178 10.630	* * Fixed Loss = 5			
	95		13.99	1.054				0.0435	0.488	Vel =	5.14		
PRV to UG	95		0.0	0.75	E	1.414	15.000 1.414 16.414	150	39.296 0.0				
	95		13.99	0.705				0.3080	5.056	Vel =	11.50		
UG to MTR	95		0.0	0.75			5.000	150	44.352 20.000	* * Fixed Loss = 20			
	95		13.99	0.745				0.2354	1.177	Vel =	10.30		
MTR to STR	95		0.0	0.75			10.000	150	65.529 2.000	* * Fixed Loss = 2			
	95		13.99	0.745				0.2354	2.354	Vel =	10.30		
			0.0							69.883	K Factor = 1.67		
STR			13.99										
*New Path													
H.1 to T.15	135		5.35	1	Utr	2.0	1.000 2.000 3.000	150	14.300 0.0				
	135		5.35	0.862				0.0197	0.059	Vel =	2.94		
T.15 to T.17	135		0.0	1	Utr	2.0	17.000 2.000 19.000	150	14.359 0.0				
	135		5.35	0.862				0.0195	0.371	Vel =	2.94		
T.17 to T.18	135		-1.84	1	Uel Utb	11.0 17.0	6.000 26.000 32.000	150	14.730 0.0				
	135		3.51	0.862				0.0089	0.286	Vel =	1.93		
T.18 to T.25	135		0.0	1	Utr	2.0	17.000 2.000 19.000	150	15.016 5.197				
	123		3.51	0.862				0.0089	0.170	Vel =	1.93		

Final Calculations : Hazen-Williams

Uponor
NLV DEVELOPMENT - UNIT B1.1 - One Head Calculation (H.1)

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Date 8/14/2023

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.25 to T.37	123 110		1.08 4.59	1 0.862	Utb 17.0	20.000 14.000 34.000	150 0.0147	20.383 5.630 0.501		Vel = 2.52	
T.37			0.0 4.59					26.514		K Factor = 0.89	
*New Path											
T.16 to H.2	135 135		3.63 3.63	1 0.862	Utr 2.0	3.000 2.000 5.000	150 0.0096	14.632 0.0 0.048		Vel = 2.00	
H.2 to T.19	135 135		0.0 3.63	1 0.862	Utr 2.0	9.000 2.000 11.000	150 0.0095	14.680 0.0 0.104		Vel = 2.00	
T.19 to T.33	135 123		-0.86 2.77	1 0.862	2Utb 34.0	17.000 28.000 45.000	150 0.0058	14.784 5.197 0.260		Vel = 1.52	
T.33 to T.32	123 123		0.65 3.42	1 0.862	Utr 2.0	1.000 2.000 3.000	150 0.0087	20.241 0.0 0.026		Vel = 1.88	
T.32 to T.27	123 123		-0.04 3.38	1 0.862	Utr 2.0	8.000 2.000 10.000	150 0.0083	20.267 0.0 0.083		Vel = 1.86	
T.27 to T.21	123 123		-1.09 2.29	1 0.862	Utr 2.0	9.000 2.000 11.000	150 0.0041	20.350 0.0 0.045		Vel = 1.26	
T.21 to H.7	123 123		0.60 2.89	1 0.862	Utr 2.0	2.000 2.000 4.000	150 0.0062	20.395 0.0 0.025		Vel = 1.59	
H.7 to T.22	123 123		0.0 2.89	1 0.862	Utr 2.0	11.000 2.000 13.000	150 0.0063	20.420 0.0 0.082		Vel = 1.59	
T.22 to T.39	123 110		0.02 2.91	1 0.862	2Utb 34.0	24.000 28.000 52.000	150 0.0063	20.502 5.630 0.329		Vel = 1.60	
T.39 to T.38	110 110		2.08 4.99	1.25 1.054	Utr 4.0	1.000 4.000 5.000	150 0.0064	26.461 0.0 0.032		Vel = 1.83	
T.38			0.0 4.99					26.493		K Factor = 0.97	
*New Path											
T.17 to H.3	135 135		1.84 1.84	1 0.862	Utr 2.0	3.000 2.000 5.000	150 0.0026	14.730 0.0 0.013		Vel = 1.01	
H.3 to H.5	135 135		0.0 1.84	1 0.862	Utr 2.0	10.000 2.000 12.000	150 0.0028	14.743 0.0 0.033		Vel = 1.01	
H.5 to T.20	135 135		0.0 1.84	1 0.862	Utr 2.0	6.000 2.000 8.000	150 0.0028	14.776 0.0 0.022		Vel = 1.01	

Final Calculations : Hazen-Williams

Uponor
NLV DEVELOPMENT - UNIT B1.1 - One Head Calculation (H.1)

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Date 8/14/2023

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.20 to T.34	135 123		0.86 2.7	1 0.862	2Utb	34.0	14.000 28.000 42.000	150 0.0055	14.798 5.197 0.232		Vel = 1.48	
T.34 to T.31	123 123		-0.65 2.05	1 0.862	Utr	2.0	10.000 2.000 12.000	150 0.0033	20.227 0.0 0.040		Vel = 1.13	
T.31 to T.30	123 123		0.05 2.1	1 0.862	Utr Uel	2.0 11.0	8.000 14.000 22.000	150 0.0035	20.267 0.0 0.076		Vel = 1.15	
T.30 to T.29	123 123		0.0 2.1	1 0.862	Uel	11.0	1.000 12.000 13.000	150 0.0035	20.343 0.0 0.045		Vel = 1.15	
T.29 to H.8	123 123		0.0 2.1	1 0.862			2.000 2.000	150 0.0035	20.388 0.0 0.007		Vel = 1.15	
H.8 to T.28	123 123		0.0 2.1	1 0.862	Uel Utr	11.0 2.0	1.000 14.000 15.000	150 0.0034	20.395 0.0 0.051		Vel = 1.15	
T.28 to T.26	123 123		0.0 2.1	1 0.862	Uel	11.0	1.000 12.000 13.000	150 0.0035	20.446 0.0 0.045		Vel = 1.15	
T.26 to T.24	123 123		0.0 2.1	1 0.862			3.000 3.000	150 0.0037	20.491 0.0 0.011		Vel = 1.15	
T.24 to T.41	123 110		-0.02 2.08	1 0.862	2Utb	34.0	34.000 28.000 62.000	150 0.0034	20.502 5.630 0.210		Vel = 1.14	
T.41 to H.13	110 110		-0.78 1.3	1 0.862	Utr	2.0	2.000 2.000 4.000	150 0.0015	26.342 0.0 0.006		Vel = 0.71	
H.13 to T.40	110 110		0.0 1.3	1 0.862	Utr	2.0	1.000 2.000 3.000	150 0.0013	26.348 0.0 0.004		Vel = 0.71	
T.40 to T.39	110 110		0.78 2.08	1 0.862	Utb Utr	17.0 2.0	16.000 16.000 32.000	150 0.0034	26.352 0.0 0.109		Vel = 1.14	
T.39			0.0 2.08						26.461		K Factor = 0.40	
*New Path												
T.19 to H.4	135 135		0.86 0.86	1 0.862	Utr	2.0	1.000 2.000 3.000	150 0.0007	14.784 0.0 0.002		Vel = 0.47	
H.4 to H.6	135 135		0.0 0.86	1 0.862	Utr	2.0	9.000 2.000 11.000	150 0.0007	14.786 0.0 0.008		Vel = 0.47	
H.6 to T.20	135 135		0.0 0.86	1 0.862			6.000 6.000	150 0.0007	14.794 0.0 0.004		Vel = 0.47	

Final Calculations : Hazen-Williams

Uponor
NLV DEVELOPMENT - UNIT B1.1 - One Head Calculation (H.1)

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Date 8/14/2023

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.20			0.0 0.86					14.798		K Factor = 0.22	
*New Path											
T.34 to H.10	123 123		0.65 0.65	1 0.862	Utr 2.0	7.000 2.000 9.000	150 0.0004	20.227 0.0 0.004		Vel = 0.36	
H.10 to H.11	123 123		0.0 0.65	1 0.862		9.000 9.000	150 0.0003	20.231 0.0 0.003		Vel = 0.36	
H.11 to T.33	123 123		0.0 0.65	1 0.862	Utr 2.0	15.000 2.000 17.000	150 0.0004	20.234 0.0 0.007		Vel = 0.36	
T.33			0.0 0.65					20.241		K Factor = 0.14	
*New Path											
T.32 to H.9	123 123		0.04 0.04	1 0.862	Utb 17.0	4.000 14.000 18.000	150 0	20.267 0.0 0.0		Vel = 0.02	
H.9 to T.31	123 123		0.0 0.04	1 0.862	Utb Utr 2.0	5.000 16.000 21.000	150 0	20.267 0.0 0.0		Vel = 0.02	
T.31			0.0 0.04					20.267		K Factor = 0.01	
*New Path											
T.27 to T.25	123 123		1.09 1.09	1 0.862	2Utb 34.0	4.000 28.000 32.000	150 0.0010	20.350 0.0 0.033		Vel = 0.60	
T.25			0.0 1.09					20.383		K Factor = 0.24	
*New Path											
T.23 to T.21	123 123		0.60 0.6	1 0.862	2Utb 34.0	4.000 28.000 32.000	150 0.0003	20.384 0.0 0.011		Vel = 0.33	
T.21			0.0 0.60					20.395		K Factor = 0.13	
*New Path											
T.22 to T.24	123 123		-0.02 -0.02	1 0.862	Utr 2.0	1.000 2.000 3.000	150 0	20.502 0.0 0.0		Vel = 0.01	
T.24			0.0 -0.02					20.502		K Factor = 0	
*New Path											
T.41 to H.14	110 110		0.78 0.78	1 0.862		7.000 7.000	150 0.0006	26.342 0.0 0.004		Vel = 0.43	
H.14 to T.40	110 110		0.0 0.78	1 0.862	Utr 2.0	9.000 2.000 11.000	150 0.0005	26.346 0.0 0.006		Vel = 0.43	

Final Calculations : Hazen-Williams

Uponor
NLV DEVELOPMENT - UNIT B1.1 - One Head Calculation (H.1)

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Date 8/14/2023

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.40			0.0 0.78					26.352		K Factor =	0.15
*New Path											
T.36 to H.12	110 110		0.55	0.75	Utb Utr 2.0	17.0 3.000 19.000 22.000	150	26.731 0.0			
H.12 to T.35	110 110		0.55	0.671	Utb 17.0	2.000 17.000 19.000	150	26.753 0.0	Vel =	0.50	
T.35			0.0 0.55					26.772		K Factor =	0.11

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: 08/21/2023

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 B1.1 - Two Head Calculation (H.6 & H.4)
Drawing : RESIDENTIAL
Location : LONGVIEW & KESSLER LEES SUMMIT MO 6481
Remote Area : 1
Contract : 44424F 002
Data File : 44424F 002 NLV Development - Longview & Kessler - Fire, Unit
Date/Time : 08/14/2023 - 02:35 PM

HYDRAULIC DESIGN INFORMATION SHEET

Name - NLV DEVELOPMENT - UNIT B1.1 Date - 08/11/2023
Location - LEES SUMMIT MO 6481
Building - RESIDENTIAL System No. - 1
Contractor - S & B PLUMBING INC. Contract No. - 44424F 002
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 20.0005 Psi Required 73.1 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

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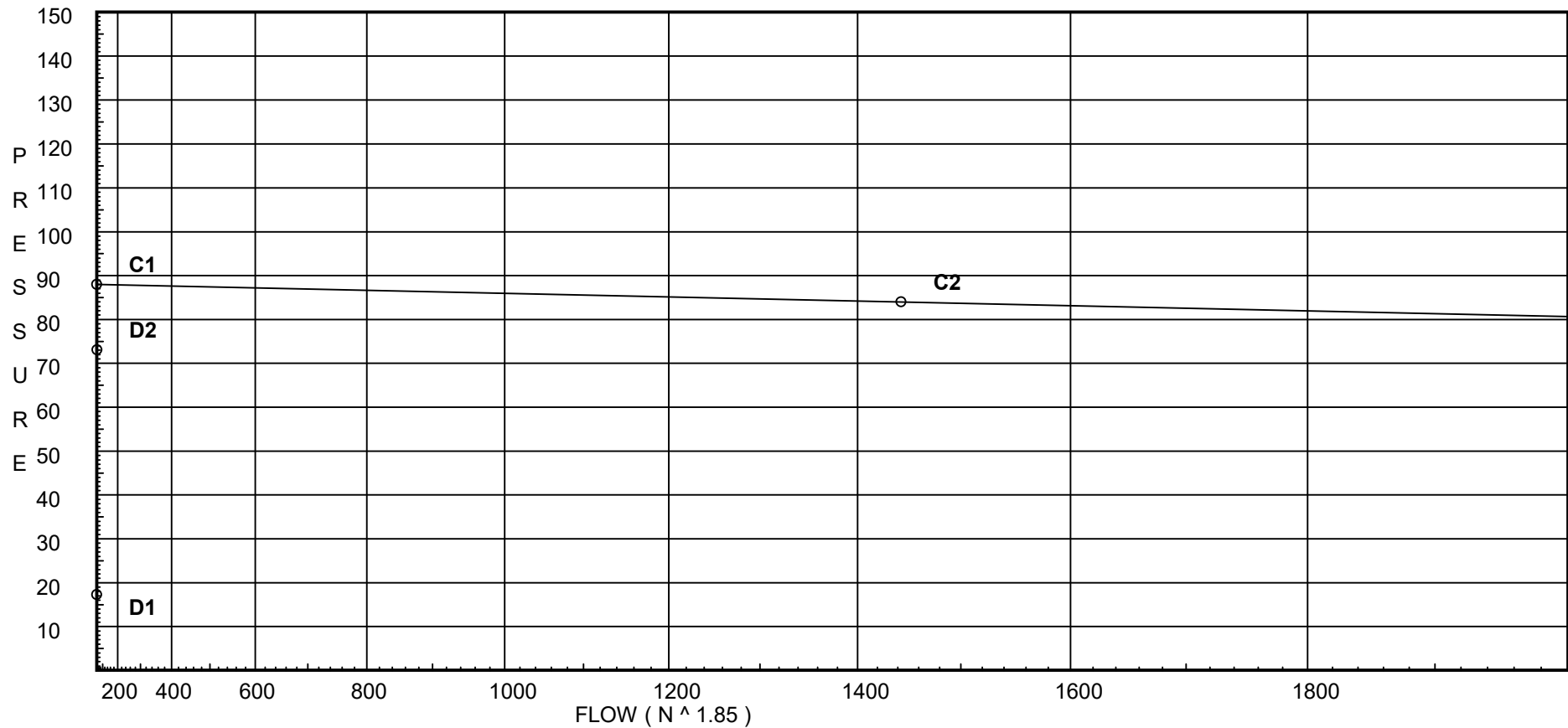
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City Water Supply:

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

Demand:

D1 - Elevation : 17.324
D2 - System Flow : 20
D2 - System Pressure : 73.098
Hose (Demand) :
D3 - System Demand : 20
Safety Margin : 14.901



Fittings Used Summary

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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
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
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	73.098

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
T.20	135.0		7.61			
T.34	123.0		13.42			
T.31	123.0		13.53			
T.30	123.0		13.71			
T.29	123.0		13.82			
H.8	123.0		13.84			
T.28	123.0		13.96			
T.26	123.0		14.07			
T.24	123.0		14.09			
T.41	110.0		20.14			
H.13	110.0		20.15			
T.40	110.0		20.16			
T.39	110.0		20.38			
T.38	110.0		20.44			
T.37	110.0		20.48			
T.36	110.0		20.9			
T.35	110.0		20.98			
S.1	108.0		22.89			
PRV	95.0		34.47			
UG	95.0		44.26			
MTR	95.0	3.7	66.54			
STR	95.0		73.1			
H.4	135.0		7.31	10.0	0.05	196
T.19	135.0		7.53			
T.33	123.0		13.46			
T.32	123.0		13.53			
T.27	123.0		13.78			
T.21	123.0		13.91			
H.7	123.0		13.95			
T.22	123.0		14.09			
H.2	135.0		7.81			
T.16	135.0		7.94			
T.23	123.0		13.91			
H.5	135.0		7.71			
H.3	135.0		7.88			
T.17	135.0		7.94			
T.18	135.0		8.41			
T.25	123.0		13.88			
H.1	135.0		7.94			
T.15	135.0		7.94			
H.10	123.0		13.43			

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.11	123.0		13.44		
H.9	123.0		13.53		
H.14	110.0		20.15		
H.12	110.0		20.94		

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	*****
*Remote Head to Supply												
H.6 to T.20	135 135	3.70	8.98	1			6.000	150	7.300 0.0			
T.20 to T.34	135 123		8.98	0.862			6.000	0.0510	0.306	Vel =	4.94	
T.20 to T.34	135 123		-4.38	1	2Utb	34.0	14.000 28.000 42.000	150	7.606 5.197 0.621			
T.34 to T.31	123 123		4.6	0.862			42.000	0.0148	0.621	Vel =	2.53	
T.34 to T.31	123 123		-1.10	1	Utr	2.0	10.000 2.000 12.000	150	13.424 0.0			
T.31 to T.30	123 123		3.5	0.862			12.000	0.0089	0.107	Vel =	1.92	
T.31 to T.30	123 123		-0.14	1	Utr Uel	2.0 11.0	8.000 14.000 22.000	150	13.531 0.0			
T.30 to T.29	123 123		3.36	0.862			22.000	0.0082	0.181	Vel =	1.85	
T.30 to T.29	123 123		0.0	1	Uel	11.0	1.000 12.000 13.000	150	13.712 0.0			
T.29 to H.8	123 123		3.36	0.862			13.000	0.0083	0.108	Vel =	1.85	
T.29 to H.8	123 123		0.0	1			2.000	150	13.820 0.0			
H.8 to T.28	123 123		3.36	0.862			2.000	0.0080	0.016	Vel =	1.85	
H.8 to T.28	123 123		0.0	1	Uel Utr	11.0 2.0	1.000 14.000 15.000	150	13.836 0.0			
T.28 to T.26	123 123		3.36	0.862			15.000	0.0083	0.124	Vel =	1.85	
T.28 to T.26	123 123		0.0	1	Uel	11.0	1.000 12.000 13.000	150	13.960 0.0			
T.26 to T.24	123 123		3.36	0.862			13.000	0.0082	0.107	Vel =	1.85	
T.26 to T.24	123 123		0.0	1			3.000	150	14.067 0.0			
T.24 to T.41	123 110		3.36	0.862			3.000	0.0083	0.025	Vel =	1.85	
T.24 to T.41	123 110		-0.35	1	2Utb	34.0	34.000 28.000 62.000	150	14.092 5.630			
T.41 to H.13	110 110		3.01	0.862			62.000	0.0068	0.419	Vel =	1.65	
T.41 to H.13	110 110		-1.13	1	Utr	2.0	2.000 2.000 4.000	150	20.141 0.0			
H.13 to T.40	110 110		1.88	0.862			4.000	0.0030	0.012	Vel =	1.03	
H.13 to T.40	110 110		0.0	1	Utr	2.0	1.000 2.000 3.000	150	20.153 0.0			
T.40 to T.39	110 110		1.88	0.862			3.000	0.0027	0.008	Vel =	1.03	
T.40 to T.39	110 110		1.13	1	Utb Utr	17.0 2.0	16.000 16.000 32.000	150	20.161 0.0			
T.39 to T.38	110 110		3.01	0.862			32.000	0.0068	0.216	Vel =	1.65	
T.39 to T.38	110 110		4.22	1.25	Utr	4.0	1.000 4.000 5.000	150	20.377 0.0			
T.38 to T.37	110 110		7.23	1.054			5.000	0.0128	0.064	Vel =	2.66	
T.38 to T.37	110 110		6.21	1.25			1.000	150	20.441 0.0			
T.37 to T.36	110 110		13.44	1.054			1.000	0.0410	0.041	Vel =	4.94	
T.37 to T.36	110 110		6.56	1.25	Utr	4.0	1.000 4.000 5.000	150	20.482 0.0			
T.36	110		20.0	1.054			5.000	0.0840	0.420	Vel =	7.35	

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.36 to T.35	110 110		-0.79 19.21	1.25 1.054			1.000 1.000	150 0.0780	20.902 0.0			
T.35 to S.1	110 108		0.79 20.0	1.25 1.054	Utr T	4.0 2.44	6.000 6.440 12.440	150 0.0842	20.980 0.866 1.048		Vel = 7.06	
S.1 to PRV	108 95		0.0 20.0	1.25 1.054	E	1.22	10.000 1.220 11.220	150 0.0841	22.894 10.630 0.944		* * Fixed Loss = 5 Vel = 7.35	
PRV to UG	95 95		0.0 20.0	0.75 0.705	E	1.414	15.000 1.414 16.414	150 0.5965	34.468 0.0 9.791		Vel = 16.44	
UG to MTR	95 95		0.0 20.0	0.75 0.745			5.000 5.000	150 0.4560	44.259 20.000 2.280		* * Fixed Loss = 20 Vel = 14.72	
MTR to STR	95 95		0.0 20.0	0.75 0.745			10.000 10.000	150 0.4559	66.539 2.000 4.559		* * Fixed Loss = 2 Vel = 14.72	
STR			0.0 20.00						73.098		K Factor = 2.34	
*New Path												
H.6 to H.4	135 135		1.02 1.02	1 0.862	Utr	2.0	9.000 2.000 11.000	150 0.0009	7.300 0.0 0.010		Vel = 0.56	
H.4 to T.19	135 135	3.70	10.00 11.02	1 0.862	Utr	2.0	1.000 2.000 3.000	150 0.0743	7.310 0.0 0.223		Vel = 6.06	
T.19 to T.33	135 123		-6.18 4.84	1 0.862	2Utb	34.0	17.000 28.000 45.000	150 0.0162	7.533 5.197 0.731		Vel = 2.66	
T.33 to T.32	123 123		1.10 5.94	1 0.862	Utr	2.0	1.000 2.000 3.000	150 0.0237	13.461 0.0 0.071		Vel = 3.27	
T.32 to T.27	123 123		0.14 6.08	1 0.862	Utr	2.0	8.000 2.000 10.000	150 0.0248	13.532 0.0 0.248		Vel = 3.34	
T.27 to T.21	123 123		-2.00 4.08	1 0.862	Utr	2.0	9.000 2.000 11.000	150 0.0118	13.780 0.0 0.130		Vel = 2.24	
T.21 to H.7	123 123		-0.21 3.87	1 0.862	Utr	2.0	2.000 2.000 4.000	150 0.0107	13.910 0.0 0.043		Vel = 2.13	
H.7 to T.22	123 123		0.0 3.87	1 0.862	Utr	2.0	11.000 2.000 13.000	150 0.0108	13.953 0.0 0.140		Vel = 2.13	
T.22 to T.39	123 110		0.35 4.22	1 0.862	2Utb	34.0	24.000 28.000 52.000	150 0.0126	14.093 5.630 0.654		Vel = 2.32	

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	*****
			0.0									
T.39			4.22								20.377	K Factor = 0.93
*New Path												
T.19 to H.2	135		6.18	1	Utr	2.0	9.000 2.000	150	7.533 0.0			
H.2	135		6.18	0.862			11.000	0.0255	0.281	Vel =	3.40	
H.2 to T.16	135		0.0	1	Utr	2.0	3.000 2.000	150	7.814 0.0			
T.16	135		6.18	0.862			5.000	0.0256	0.128	Vel =	3.40	
T.16 to T.23	135		-0.18	1	Utr Utb	2.0 17.0	16.000 16.000	150	7.942 5.197			
T.23	123		6.0	0.862			32.000	0.0241	0.772	Vel =	3.30	
T.23 to T.38	123		0.20	1	Utb	17.0	21.000 14.000	150	13.911 5.630			
T.38	110		6.2	0.862			35.000	0.0257	0.900	Vel =	3.41	
			0.0									
T.38			6.20								20.441	K Factor = 1.37
*New Path												
T.20 to H.5	135		4.38	1	Utr	2.0	6.000 2.000	150	7.606 0.0			
H.5	135		4.38	0.862			8.000	0.0134	0.107	Vel =	2.41	
H.5 to H.3	135		0.0	1	Utr	2.0	10.000 2.000	150	7.713 0.0			
H.3	135		4.38	0.862			12.000	0.0135	0.162	Vel =	2.41	
H.3 to T.17	135		0.0	1	Utr	2.0	3.000 2.000	150	7.875 0.0			
T.17	135		4.38	0.862			5.000	0.0136	0.068	Vel =	2.41	
T.17 to T.18	135		0.18	1	Uel Utb	11.0 17.0	6.000 26.000	150	7.943 0.0			
T.18	135		4.56	0.862			32.000	0.0145	0.465	Vel =	2.51	
T.18 to T.25	135		0.0	1	Utr	2.0	17.000 2.000	150	8.408 5.197			
T.25	123		4.56	0.862			19.000	0.0145	0.276	Vel =	2.51	
T.25 to T.37	123		2.00	1	Utb	17.0	20.000 14.000	150	13.881 5.630			
T.37	110		6.56	0.862			34.000	0.0286	0.971	Vel =	3.61	
			0.0									
T.37			6.56								20.482	K Factor = 1.45
*New Path												
T.16 to H.1	135		0.18	1	Utr	2.0	5.000 2.000	150	7.942 0.0			
H.1	135		0.18	0.862			7.000	0	0.0	Vel =	0.10	
H.1 to T.15	135		0.0	1	Utr	2.0	1.000 2.000	150	7.942 0.0			
T.15	135		0.18	0.862			3.000	0	0.0	Vel =	0.10	
T.15 to T.17	135		0.0	1	Utr	2.0	17.000 2.000	150	7.942 0.0			
T.17	135		0.18	0.862			19.000	0.0001	0.001	Vel =	0.10	

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.17			0.0 0.18						7.943		K Factor = 0.06	
*New Path												
T.34 to H.10	123 123		1.10 1.1	1 0.862	Utr	2.0	7.000 2.000 9.000	150 0.0010	13.424 0.0 0.009		Vel = 0.60	
H.10 to H.11	123 123		0.0 1.1	1 0.862			9.000 9.000	150 0.0011	13.433 0.0 0.010		Vel = 0.60	
H.11 to T.33	123 123		0.0 1.1	1 0.862	Utr	2.0	15.000 2.000 17.000	150 0.0011	13.443 0.0 0.018		Vel = 0.60	
T.33			0.0 1.10						13.461		K Factor = 0.30	
*New Path												
T.31 to H.9	123 123		0.14 0.14	1 0.862	Utb Utr	17.0 2.0	5.000 16.000 21.000	150 0	13.531 0.0 0.0		Vel = 0.08	
H.9 to T.32	123 123		0.0 0.14	1 0.862	Utb	17.0	4.000 14.000 18.000	150 0.0001	13.531 0.0 0.001		Vel = 0.08	
T.32			0.0 0.14						13.532		K Factor = 0.04	
*New Path												
T.27 to T.25	123 123		2.00 2.0	1 0.862	2Utb	34.0	4.000 28.000 32.000	150 0.0032	13.780 0.0 0.101		Vel = 1.10	
T.25			0.0 2.00						13.881		K Factor = 0.54	
*New Path												
T.21 to T.23	123 123		0.21 0.21	1 0.862	2Utb	34.0	4.000 28.000 32.000	150 0	13.910 0.0 0.001		Vel = 0.12	
T.23			0.0 0.21						13.911		K Factor = 0.06	
*New Path												
T.24 to T.22	123 123		0.34 0.34	1 0.862	Utr	2.0	1.000 2.000 3.000	150 0.0003	14.092 0.0 0.001		Vel = 0.19	
T.22			0.0 0.34						14.093		K Factor = 0.09	
*New Path												
T.41 to H.14	110 110		1.13 1.13	1 0.862			7.000 7.000	150 0.0011	20.141 0.0 0.008		Vel = 0.62	
H.14 to T.40	110 110		0.0 1.13	1 0.862	Utr	2.0	9.000 2.000 11.000	150 0.0011	20.149 0.0 0.012		Vel = 0.62	

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	*****
			0.0									
T.40			1.13								20.161	K Factor = 0.25
*New Path												
T.36 to H.12	110		0.79	0.75	Utb Utr	17.0 2.0	3.000 19.000 22.000	150	20.902 0.0			
H.12			110	0.79	0.671			0.0019	0.042	Vel = 0.72		
H.12 to T.35	110		0.0	0.75	Utb	17.0	2.000 17.000 19.000	150	20.944 0.0			
T.35			110	0.79	0.671			0.0019	0.036	Vel = 0.72		
			0.0									
T.35			0.79								20.980	K Factor = 0.17