



Reviewed for Fire Code Compliance  
 Leslie Jackson  
03/10/2025 10:36:25 AM

**Fire Marshal Division**  
P.O. Box 370  
Lillington, NC 27546  
910-893-7580

# Application for Plan Review

Permit Type: \_\_\_\_\_

Date Received: \_\_\_\_\_ Received By: \_\_\_\_\_

Name of Project: \_\_\_\_\_

Physical Address of Project: \_\_\_\_\_

Plans Submitted By: \_\_\_\_\_

Project Phone: (\_\_\_\_\_) - \_\_\_\_ - \_\_\_\_

Contact Person/Address: \_\_\_\_\_  
\_\_\_\_\_

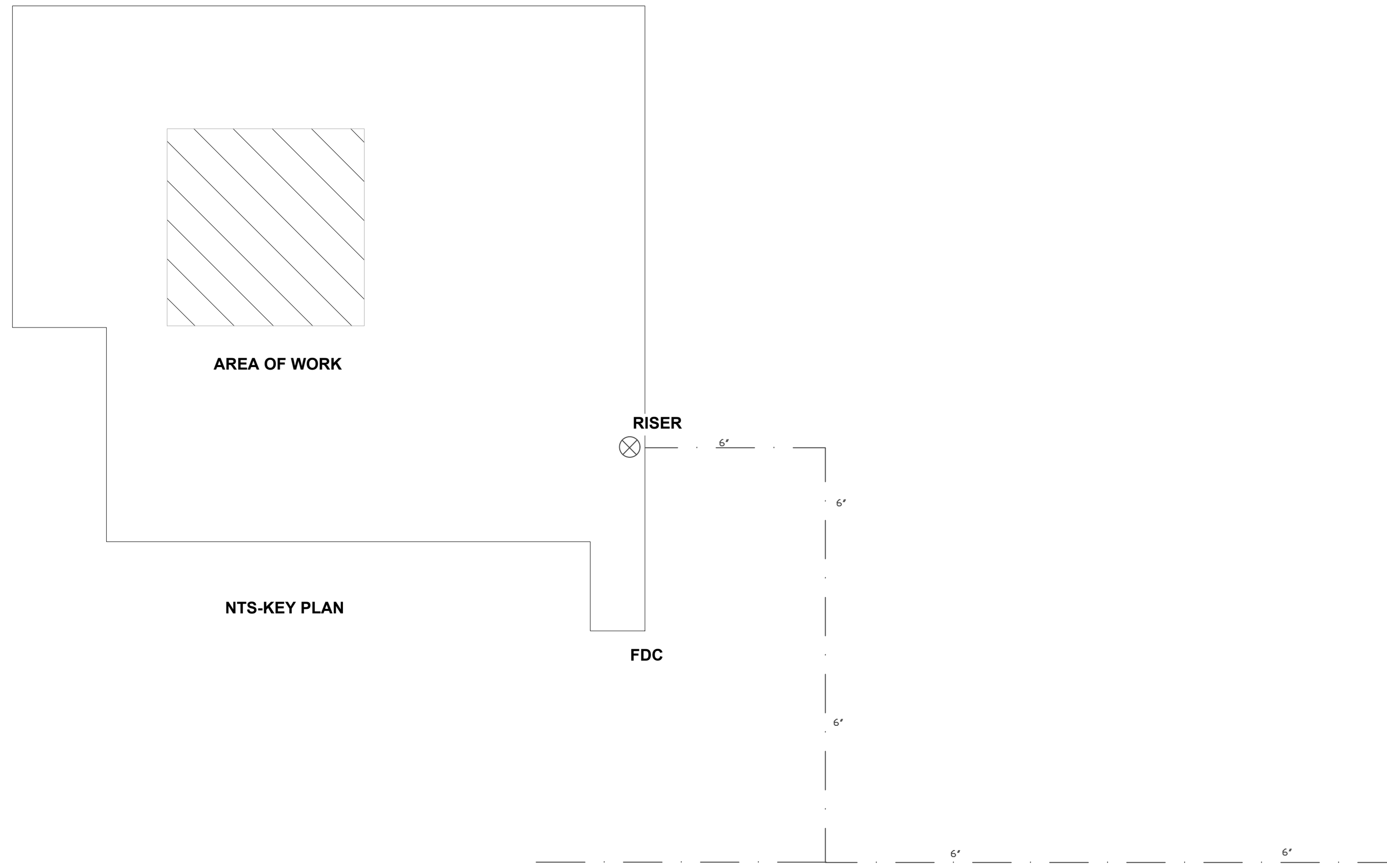
Contact Phone: (\_\_\_\_\_) - \_\_\_\_ - \_\_\_\_ (\_\_\_\_\_) - \_\_\_\_ - \_\_\_\_

Contractor's Name/Info: \_\_\_\_\_  
\_\_\_\_\_

Contractor's Phone: (\_\_\_\_\_) - \_\_\_\_ - \_\_\_\_

Contact Email: \_\_\_\_\_

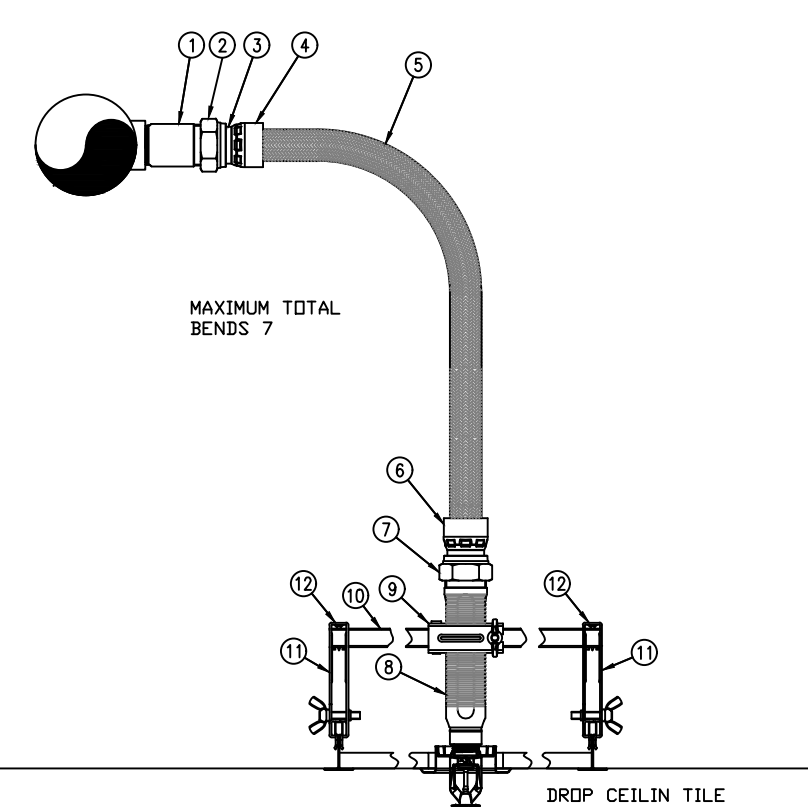
- **Plans that are submitted will be reviewed as quickly as possible with an average time of review between 7-10 working days.**
- **Status checks may be conducted on plan reviews by visiting the website <http://hteweb.harnett.org/Click2GovBP/Index.jsp> or by calling the Harnett County Central Permitting Office (910-893-7525 : Opt. 2), or the Harnett County Fire Marshal's Office (910-893-7580).**
- **Approved plans must be picked up from the Central Permitting Office and all fees paid before any required inspections can be conducted.**



**Victaulic Victflex Stainless Steel Sprinkler Fitting System:**

In lieu of rigid pipe offsets or return bands for sprinkler drops, the Victaulic Victflex Stainless Steel Sprinkler Fitting System may be used to locate sprinklers as required by final finished ceiling line and walls. The drop system shall consist of a braided or unbraided (corrugated) type 304 stainless steel flexible tube, a zinc plated steel 1/2" NPT male threaded nipple for connection to branchline piping, and a zinc plated steel reducer with a 1/2" or 3/4" NPT female thread for connection to the sprinkler head. Union joints shall be provided for ease of installation. The flexible drop shall attach to the ceiling grid using a one-piece clamp girth bracket. (The bracket shall allow for sprinkler installation before or after the bracket is secured to the sprinkler grid.) The braided drop system is FM approved for sprinkler services to 200 psi (1380 kPa) and can be installed without the use of tools, and the corrugated system is UL Listed for sprinkler services to 175 psi (1207 kPa).

**NOTE**  
MODEL A42 VIFLEX HOSE, 6'-0" LONG  
EQUIVALENT LENGTH OF 1" SCH 40 PIPE, 4.3'  
ALL NEW DROPS IN HYDRAULIC CALCULATIONS  
WERE BASED ON USING 6" FLOODROPS



- PRODUCT LEGEND**
- 1" WIRE BRACKET
  - NUT
  - ADAPTER RING
  - COLLAR
  - 3/4" STAINLESS STEEL FLEXIBLE BRAIDED HOSE (1" NOMINAL DIAMETER)
  - 3/4" LENGTHS AVAILABLE 31", 48", 67", & 72"
  - COLLAR
  - NUT
  - REDUCING OUTLET (AVAILABLE 1/2" OR 3/4" NPT)
  - CENTER BRACKET ASSEMBLY
  - SQUARE BAR (AVAILABLE IN 34" AND 48" LENGTHS)
  - END BRACKET ASSEMBLY
  - SHEET METAL SCREW
- SEE VICTALIC SUBMITAL NUMBER 10.85

**NOTES:**

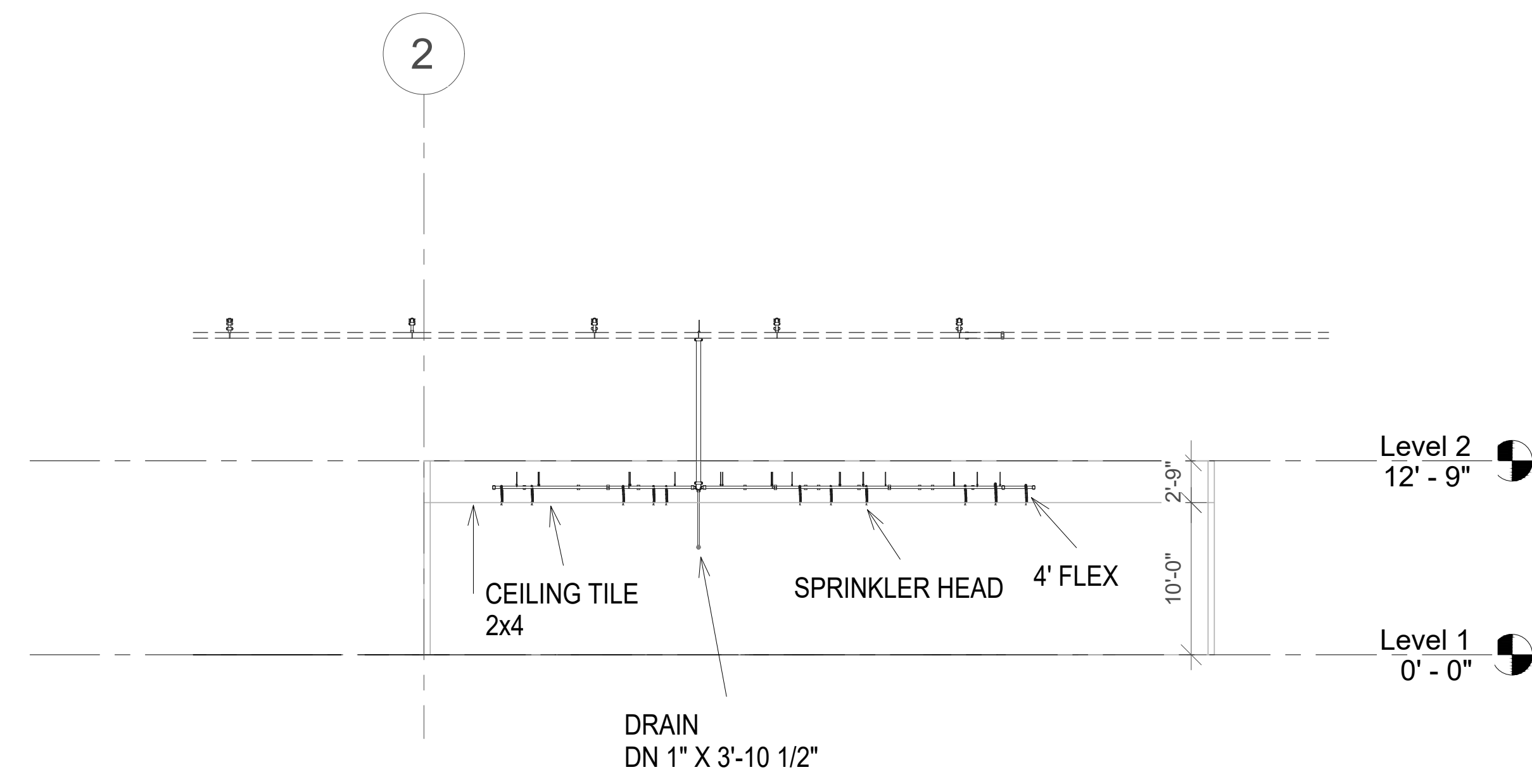
1. REFER TO VICTALIC SUBMITAL 10.85 FOR ADDITIONAL DETAILS.
2. THIS PRODUCT IS APPROVED TO APPLICABLE FM STANDARDS AND REQUIREMENTS BY FACTORY METAL TEST.

Sprinkler Design Data		System: Wet
Project: KSE Scientific	System: Wet	
Project Street Address: 900 Edwards Brothers Dr.	Floor#:	Sys. Sq. Ft.: n/a
Sub: Clean Rooms	Phone: (910) 892-1700	Ceiling Height: Varies
Designed By: Carolina Fire Protection	Hazard: Ord. Cpt. 2	Total Bldg. Hgt.: 12'-0" +/-
Occupancy: Manufacturing		

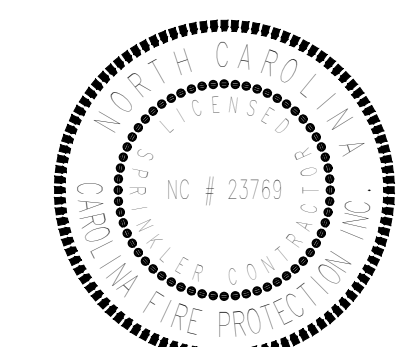
Design Summary	
Design Method	Hydraulic Calculation
Design Area #	1
Location	Clean Rooms
Type of System	Wet System
Hazard Class	Ord. Cpt. 2
Criteria From	NFPA 13
Design Area	1052 sq ft
System Backing	130' HBT
Density	20
K-factor	5.6
Hose Allowance	250
# Design Sprinklers	13
Special App. Risk	0
Requirement @	BCR
G.P.M. Req'd	340.722
P.S.I. Req'd	65.501
Safety Factor @	TEST
Safety Factor (ps)	21.840
System Sq Ft	n/a
Dry Sys. Vol. (gal)	n/a

Water Supply Information			
Tested by:	Andrew King Engineering, PLLC	Date/Time:	12/16/24 Pressure Hydrant
Hydrant Elevation:	174	Flow Hydrant #1:	617 GPM
Static (PSI):	93	Residual (PSI):	53
		Flow Hydrant #2:	617 GPM
		Flow (gpm):	1700 GPM

- GENERAL NOTES**
- ALL WORK SHALL BE IN FULL COMPLIANCE WITH NFPA 13 (2013) AND THE NC STATE FIRE CODE.
  - SCOPE OF WORK: CFP (CAROLINA FIRE PROTECTION) IS TO ADD (20) NEW CONCEALED PENDENT SPRINKLER HEADS IN
  - ALL PIPE 1 1/4" AND LARGER ARE TO BE BLACK SCHEDULE 10 GROOVED WITH GROOVED FITTINGS.
  - ALL MATERIALS TO BE U.L. LISTED AS REQUIRED BY NFPA 13.
  - SYSTEM IS DESIGNED TO PROVIDE A DENSITY OF .20 GPM OVER THE MOST REMOTE AREA (1052 SQ FT).



**INFO NTS**



SPRINKLER SYMBOL DESCRIPTION							
SYMBOL	SIZE	MODEL	MAKE	SN	FINISH	STYLE	TOTAL
●	1/2"	QR	VICTAULIC	V5606	CHROME	RECESSED PENDENT	20
TOTAL SPRINKLERS SHOWN ON THIS SHEET							0
TOTAL SPRINKLERS REQUIRED ON THIS CONTRACT							20

**CAROLINA FIRE PROTECTION**  
4055 HODGES CHAPEL ROAD  
Dunn, N.C. 28334  
Phone (910) 892-1700  
Fax (910) 892-7322

CONTRACT NAME: <b>KSE Scientific</b> 900 Edwards Brothers Dr. Lillington, NC	CHECKED BY: M.FORD
CONTRACT WITH: KSE Scientific	DATE: 02-25-2025
DESCRIPTION: FIT-UP	SCALE: AS SHOWN
SYSTEM DESIGN DATA	CONTRACT NO: 24L977
DRAWN BY: ALEE	DRAWING NO. FP 1 of 2

**IMPORTANT**

In locations that are subject to freezing conditions, it is the owner's responsibility to provide heat throughout areas protected by wet pipe sprinkler systems and in enclosures for dry pipe, deluge or other types of valves controlling water supplies to sprinkler systems.

This drawing including all information and design concept herein contained is the property of Carolina Fire Protection Company, Inc. and is loaned upon express conditions that the same be returned to CFP, Inc. upon request; all information contained herein shall be treated as secret, and confidential; no reproduction of this drawing or any part thereof shall be made without written consent of CFP, Inc.

CONTRACT RESPONSIBILITIES	
ITEM	C.F.P. / OTHERS
STREET WATER CONNECTION	N/A
UNDERGROUND WATER MAINS	N/A
EXCAVATIONS	N/A
BACKFILL	N/A
WIRING	N/A
PAINTING	N/A

SYMBOLS	
⊕	CEILING HT. ABOVE REF.
⊕	C/L OF PIPE BELOW BOD
⊕	C/L OF PIPE ABOVE REF.
⊕	HYDRAULIC REF. POINT
⊕	LINE DESIGNATION
⊕	MAIN DESIGNATION
⊕	HANGER
⊕	UNION
⊕	GROOVED COUPLING (GC)
⊕	SCREWED CAP
⊕	GROOVED CAP
⊕	SCREWED PLUG
⊕	FLANGED CONNECTION

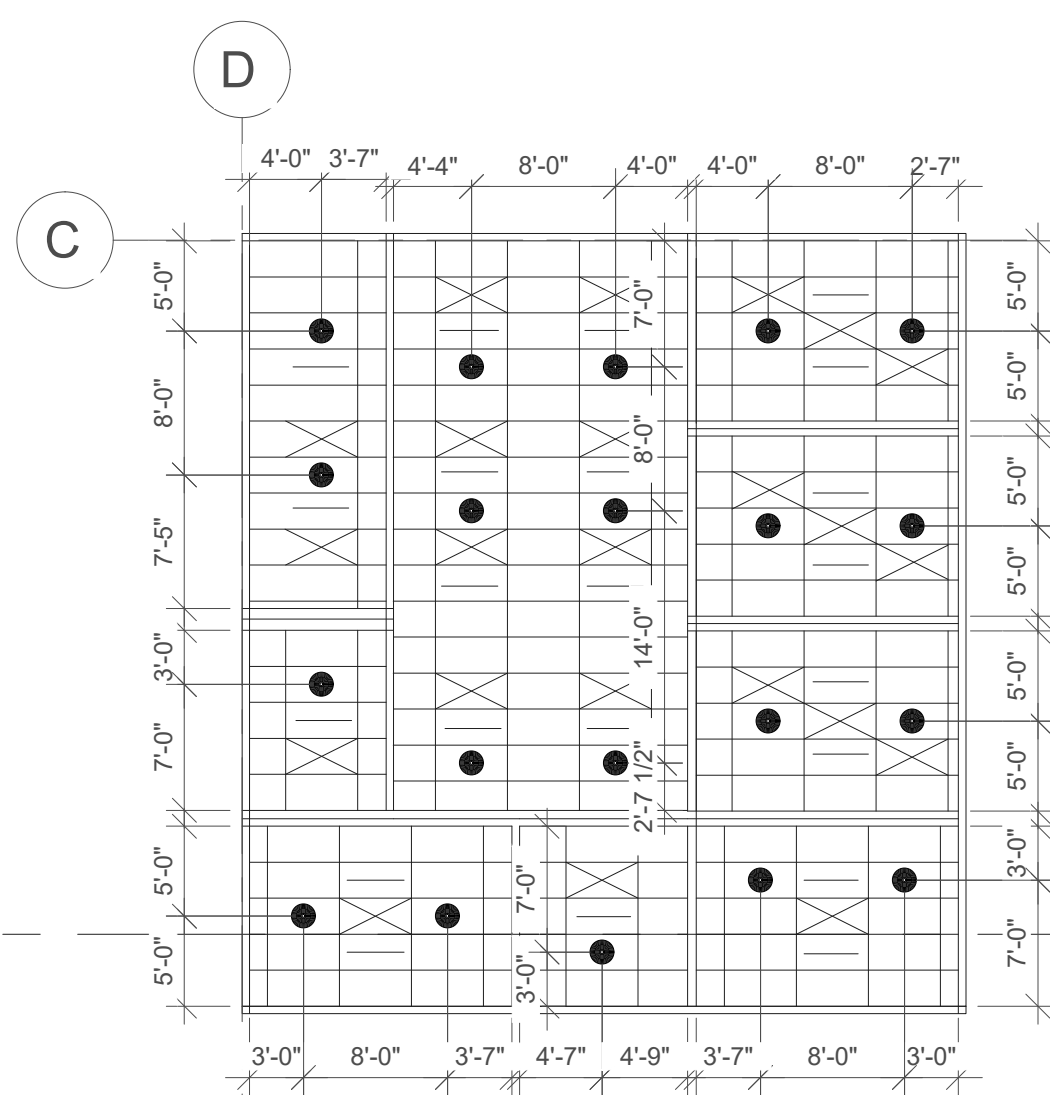
SYMBOLS	
⊕	GATE VALVE (SEE NOTES)
⊕	FIRE HOSE ASSEMBLY
⊕	FLOW SWITCH (FS)
⊕	MONITOR SWITCH
⊕	BUTTERFLY VALVE
⊕	ALARM VALVE (ALV)
⊕	DRY PIPE VALVE
⊕	WAFER CHECK VALVE
⊕	SWING CHECK VALVE
⊕	SYSTEM RISER
⊕	INSPECTOR'S TEST
⊕	GLOBE VALVE
⊕	ANGLE VALVE

ABBREVIATIONS	
BOB	Bottom of Beam
BOD	Bottom of Deck
BOP	Bottom of Pipe
DO	Drain
HV	Hose Valve
N & C	Nipple and Cap
NIC	Not in Contract
NTS	Not to Scale
OBJ	Open Bar Joist
RM	Roof Manifold
SP	Standpipe
TGB	Top of Beam
TOP	Top of Pipe
TOS	Top of Steel
UNO	Unless Noted Otherwise

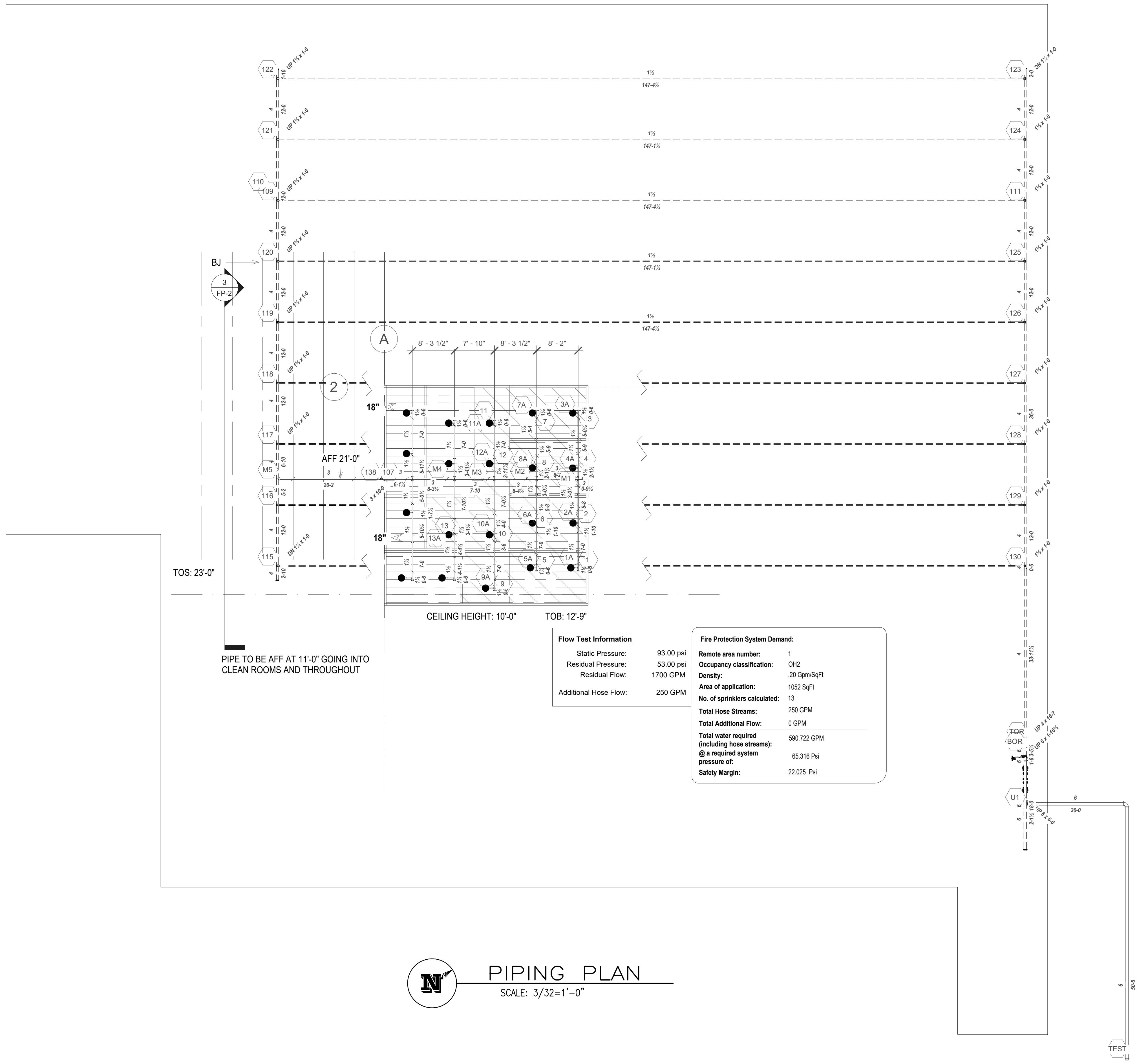
SYSTEM TYPE	
WET- <input checked="" type="checkbox"/>	DELUGE- <input type="checkbox"/>
DRY- <input type="checkbox"/>	PREACTION- <input type="checkbox"/>

APPROVALS	
<input type="checkbox"/> ISO	OUT IN
<input type="checkbox"/> FR	OUT IN
<input type="checkbox"/> FM	OUT IN
<input type="checkbox"/>	OUT IN

NO.	DATE	BY	REVISIONS - SEE FLAGGED AREA ON PLAN



**CEILING PLAN**  
SCALE: 3/32"=1'-0"



**PIPING PLAN**  
SCALE: 3/32"=1'-0"

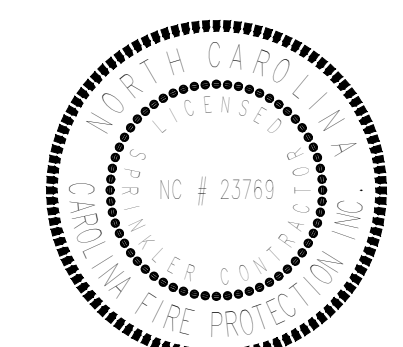
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In locations that are subject to freezing conditions, it is the owner's responsibility to provide heat throughout areas protected by wet pipe sprinkler systems and in enclosures for dry pipe, deluge or other types of valves controlling water supplies to sprinkler systems.  
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CONTRACT RESPONSIBILITIES	
ITEM	C.F.P. / OTHERS
STREET WATER CONNECTION	N/A
UNDERGROUND WATER MAINS	N/A
EXCAVATIONS	N/A
BACKFILL	N/A
WIRING	N/A
PAINTING	N/A

SYMBOLS	
⊙	CEILING HT. ABOVE REF.
⊙+1.3	C/L OF PIPE BELOW BOB
⊙-1.3	C/L OF PIPE ABOVE REF.
⊙	HYDRAULIC REF. POINT
⊙	LINE DESIGNATION
⊙	MAIN DESIGNATION
⊙	HANGER
⊙	UNION
⊙	GROOVED COUPLING (CC)
⊙	SCREWED CAP
⊙	SCREWED PLUG
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⊙	GATE VALVE (SEE NOTES)
⊙	FIRE HOSE ASSEMBLY
⊙	FLOW SWITCH (FS)
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⊙	DRY PIPE VALVE
⊙	WATER CHECK VALVE
⊙	SWING CHECK VALVE
⊙	SYSTEM RISER
⊙	INSPECTOR'S TEST
⊙	GLOBE VALVE
⊙	ANGLE VALVE
⊙	ELECTRIC BELL
⊙	WATER MOTOR GONG (WMG)
⊙	FIRE DEPT. CONN. (STANDARD)
⊙	FIRE DEPT. CONN. (FLUSH)
⊙	Nipple and Cap
⊙	POST INDICATOR VALVE (PIV)
⊙	Open Bar Joint
⊙	Pressure Red. Valve
⊙	Roof Manifold
⊙	Standpipe
⊙	Top of Steam
⊙	Top of Pipe
⊙	Top of Steel
⊙	UNO
⊙	2&4 WAY SEISMIC BRACING
⊙	ELEVATION CHANGE IN PIPE (NOT THROUGH FLOOR)

ABBREVIATIONS	
BBB	Bottom of Beam
BBB	Bottom of Deck
BBB	Bottom of Pipe
BOB	Bottom of Beam
BOB	Bottom of Deck
BOB	Bottom of Pipe
N & C	Nipple and Cap
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NTS	Not to Scale
OBJ	Open Bar Joint
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SYSTEM TYPE	
WET - <input checked="" type="checkbox"/>	DELUGE - <input type="checkbox"/>
DRY - <input type="checkbox"/>	PREACTION - <input type="checkbox"/>
APPROVALS	
<input type="checkbox"/> ISO	OUT IN
<input type="checkbox"/> IRI	OUT IN
<input type="checkbox"/> FM	OUT IN
<input type="checkbox"/>	OUT IN



SPRINKLER SYMBOL DESCRIPTION									
SYMBOL	SIZE	MODEL	MAKE	SIN	FINISH	STYLE	TEMP	K-FACTOR	TOTAL
●	1/2"	QR	VICTAULIC	V5606	CHROME	RECESSED PENDENT	155°	5.6	20
TOTAL SPRINKLERS SHOWN ON THIS SHEET									20
TOTAL SPRINKLERS REQUIRED ON THIS CONTRACT									20

**CAROLINA FIRE PROTECTION**  
 4055 HODGES CHAPEL ROAD  
 DUNN, N.C. 28334  
 Phone (910) 892-1700  
 Fax (910) 892-7322

CONTRACT NAME:		CHECKED BY:	
KSE Scientific		M.FORD	
900 Edwards Brothers Dr. Lillington, NC		DATE: 02-25-2025	
CONTRACT WITH: KSE Scientific		SCALE: AS SHOWN	
DESCRIPTION: PIPING AND CEILING		CONTRACT NO: 24L977	
SYSTEM DESIGN DATA		DRAWN BY: ALEE	
HAZARD CLASSIFICATION: --- SYSTEM AREA: --- SQ. FT.		DRAWING NO. FP 2 of 2	
HYDRAULIC DENSITY: --- GPM/SQ. FT. HOSE ALLOWANCES: --- SQ. FT./HEAD			
AREA OF APPLICATION: --- SQ. FT. ROSE ALLOWANCES: --- GPM			
TOTAL SYSTEM REQUIREMENTS: --- GPM AT --- PSI AT ---			
WATER SUPPLY STATIC PRESSURE: --- PSI RESIDUAL PRESSURE: --- PSI W/ --- GPM FLOWING			
SEE SHEET FP-1 FOR DESIGN CRITERIA			

## **FIRE HYDRANT FLOW TEST RESULTS**

### **TEST LOCATION**

Address: 900 Edwards Brothers Drive, Lillington

Proposed Tap Location: \_\_\_\_\_

Requested Flow Location: nearest hydrant to the proposed point of connection

### **APPLICANT**

Name: Darrel Moser

Address: 1012 N Wellonsburg Place, Apex, NC 27502

Contact Person: Darrel Moser Phone: 919.810.0443 Fax: \_\_\_\_\_

### **TESTING AGENT**

Firm Name: Andrew King Engineering, PLLC

Address: 5917 Shedd Drive, Raleigh, North Carolina 27603

Phone: (919) 906-5236 Email: Drew@AndrewKingEngineering.com

### **SYSTEM ANALYSIS**

Main Size: 6"

Elevation of Test Location: 174' +/-

Nearest Elevated Tank: Lillington

Time of Test: 1:00 PM

Tank Elevation: 387.7' (55.7')

Pressure Zone: 392' (60')

Theoretical Pressure: 92.5 psi

Calculated by: Drew King

Witnessed by: N/A

### **RESULTS**

Static Pressure: 93 psi

2" Pitotless Nozzle Reading: 14 & 14 psi

Residual Pressure: 53 psi

Volume: 617 + 617 = 1,234 gpm

Disclaimer: These results are an instantaneous snap-shot of the system. It is recommended that the designer allow adequate safety to include low tank level.

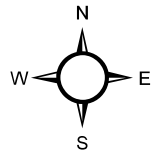
Comments: Flowed ( 2 ) 2-1/2" Hose Monster(s) w/ 2" Pitotless  
Nozzle(s). (2" Pitotless Nozzle C = 1.38)

Completed by: Drew King

Date: 12/16/2024



County Boundary	Fire Hydrants	Road Centerlines
City Limits	0 – 5	Parcels
Address Numbers	> 5 – 16	



# Hydrant Flow Test Report

Test Date 12/16/2024

Test Time 1:00 PM

## Location

ILC Dover  
900 Edwards Brothers Drive  
Lillington, NC

## Tested by

Andrew King Engineering, PLLC  
5917 Shedd Drive  
Raleigh, NC 27603  
Drew@AndrewKingEngineering.com  
919-906-5236

## Notes

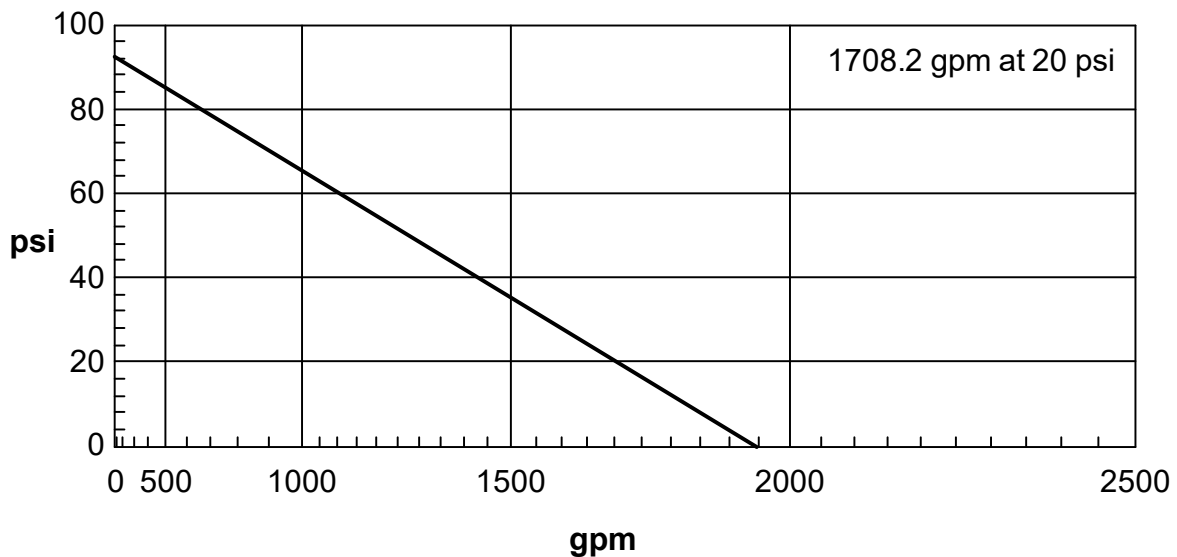
## Read Hydrant

93 psi **static pressure**  
53 psi **residual pressure**  
174 ft **hydrant elevation**

## Flow Hydrant(s)

Outlet	Elev	Size	C	Pitot Pressure	Flow
#1	174	2	1.38	14	617 gpm
#2	174	2	1.38	14	617 gpm
<b>Total</b>					<b>1234 gpm</b>

## Flow Graph





#### THIS DEVICE IS FM APPROVED

The pressure vs. flow rate data developed within this flow chart is based on the average K-factor measured during laboratory testing. This data has been determined to be within the acceptable limitations for accuracy. It is the user's responsibility to verify that the correct chart and column is being used.

**HM2H | 2 1/2" Hose Monster® Model II or Flusher with flow splitter (HM2H, HM2HF)**  
Use this column if the Pitotless Nozzle® is connected to the 2 1/2" Hose Monster® or Flusher. The built-in pitot or flow splitter must be installed for accuracy.

**OA | Open Atmosphere** - Use this column when the Pitotless Nozzle® is connected directly to a test header or hydrant flowing openly to atmosphere.

#### GET THE MOST OUT OF YOUR HOSE MONSTER® HARDWARE

#### FIRE PUMP TESTING SOFTWARE

Professional-grade software that helps you work better! Keep your reports clean, your results accurate, and your process streamlined with Hose Monster's FPT Software.

LEARN MORE AT [HOSEMONSTER.COM/RESOURCES](https://www.hosemonster.com/resources)

HM2H			HM2H			HM2H		
PSI	GPM	OA GPM	PSI	GPM	OA GPM	PSI	GPM	OA GPM
10	521	529	31	918	931	52	1188	1206
11	547	555	32	932	946	53	1200	1217
12	571	579	33	947	960	54	1211	1229
13	594	603	34	961	975	55	1222	1240
14	617	626	35	975	989	56	1233	1251
15	638	648	36	989	1003	57	1244	1262
16	659	669	37	1002	1017	58	1255	1273
17	679	689	38	1016	1031	59	1266	1284
18	699	709	39	1029	1044	60	1277	1295
19	718	729	40	1042	1057	61	1287	1306
20	737	748	41	1055	1071	62	1298	1317
21	755	766	42	1068	1084	63	1308	1327
22	773	784	43	1081	1096	64	1318	1338
23	790	802	44	1093	1109	65	1329	1348
24	807	819	45	1106	1122	66	1339	1358
25	824	836	46	1118	1134	67	1349	1369
26	840	853	47	1130	1146	68	1359	1379
27	856	869	48	1142	1158	69	1369	1389
28	872	885	49	1154	1170	70	1379	1399
29	887	900	50	1165	1182			
30	903	916	51	1177	1194			

## COEFFICIENT AND K-FACTOR TABLE FOR VARIOUS FLOW DEVICES

PITOTLESS NOZZLE™	K-FACTOR	COEFFICIENT	ORIFICE DIAMETER	psi RANGE	FLOW RANGE (GPM)
2" Pitotless Nozzle + Little Hose Monster	156.0	1.31	2"	10-70	493-1305
<b>2" Pitotless Nozzle + 2 1/2" Hose Monster</b>	<b>164.8</b>	<b>1.38</b>	<b>2"</b>	<b>10-70</b>	<b>521-1379</b>
2" Pitotless Nozzle + Open Atmosphere	167.2	1.40	2"	10-70	529-1399
1 3/4" Pitotless Nozzle + Little Hose Monster	104.7	1.15	1.75"	10-80	331-936
1 3/4" Pitotless Nozzle + 2 1/2" Hose Monster	106.6	1.17	1.75"	10-80	337-953
1 3/4" Pitotless Nozzle + Open Atmosphere	109.7	1.20	1.75"	10-80	347-981
1 1/8" Pitotless Nozzle + Little Hose Monster	37.2	0.98	1.125"	10-80	83-333
1 1/8" Pitotless Nozzle + 2 1/2" Hose Monster	37.4	0.99	1.125"	10-80	84-335
1 1/8" Pitotless Nozzle + Open Atmosphere	37.0	0.98	1.125"	10-80	83-331
1" Pitotless Nozzle + Little Hose Monster	27.2	0.91	1"	3-80	47-243
1" Pitotless Nozzle + 2 1/2" Hose Monster	27.6	0.93	1"	3-80	48-247
1" Pitotless Nozzle + Open Atmosphere	27.7	0.93	1"	3-80	48-248

IN-LINE PITOTLESS NOZZLE™	K-FACTOR	COEFFICIENT	ORIFICE DIAMETER	psi RANGE	FLOW RANGE (GPM)
2" In-line Pitotless Nozzle	165.3	1.38	2"	10-75	523-1432
1 3/4" In-line Pitotless Nozzle	109.9	1.20	1.75"	5-80	246-983
1 1/8" In-line Pitotless Nozzle	38.4	1.02	1.125"	5-70	86-321
1 1/2" In-line Pitotless Nozzle	31.7	1.06	1.0"	2-90	45-301

BIGBOY HOSE MONSTER™	K-FACTOR	COEFFICIENT	ORIFICE DIAMETER	psi RANGE	FLOW RANGE (GPM)
5-11psi (BigBoy Hose Monster)	382.9	1.38	3.05"	5-11	856-1270
12-38psi (BigBoy Hose Monster)	376.0	1.35	3.05"	12-38	1303-2318
39-55psi (BigBoy Hose Monster)	372.0	1.34	3.05"	39-55	2323-2759

NOTE: Due to the shape and size of the BigBoy Pitotless Nozzle, the BigBoy Hose Monster uses three different K-factors over its operating range.

2 1/2" Hose Monster®	K-FACTOR	COEFFICIENT	ORIFICE DIAMETER	psi RANGE	FLOW RANGE (GPM)
2 1/2" Hose Monster	168.67	0.906	2.5"	10-70	533-1411
1 3/4" Nozzle Insert	89.04	0.975	1.75"	10-70	282-745
1 1/8" Nozzle Insert	37.36	0.990	1.25"	10-70	118-313

4" & 4 1/2" Hose Monster®	K-FACTOR	COEFFICIENT	CONNECTION DIAMETER	psi RANGE	FLOW RANGE (GPM)
4 1/2" Hose Monster	331.07	0.548	4.5"	10-70	1047-2770
4" Hose Monster	339.65	0.712	4"	10-70	1074-2842

### USING SOFTWARE

Use the table to the right if you are using software that requires the coefficient input to be less than '1.0.' Notice that the orifice diameter must be changed from its true diameter in order to accommodate the lower coefficient. This is necessary only for the 2" Pitotless Nozzle and the 3/4" Pitotless Nozzle.

DEVICE	COEFFICIENT	ORIFICE DIAMETER
--------	-------------	------------------

2" Pitotless Nozzle + Little Hose Monster	0.99	2.30"
2" Pitotless Nozzle + 2 1/2" Hose Monster	0.99	2.36"
2" Pitotless Nozzle + Open Atmosphere	0.99	2.38"
1 3/4" Pitotless Nozzle + Little Hose Monster	0.99	1.88"
1 3/4" Pitotless Nozzle + 2 1/2" Hose Monster	0.99	1.90"
1 3/4" Pitotless Nozzle + Open Atmosphere	0.99	1.93"

NOTE: If your software uses the Theoretical Discharge Formula, found in NFPA 291, 4.7.3, the coefficient of discharge can be used to produce flow rates that will match our flow charts.

### A HAND-HELD PITOT DIRECTLY AT A HYDRANT OUTLET

OUTLET TYPE	COEFFICIENT
Outlet smooth and rounded	0.9
Outlet square and sharp	0.8
Outlet square and projecting into barrel	0.7
If a stream straightener is used	0.95

### CLASSIFYING AND MARKING OF HYDRANTS

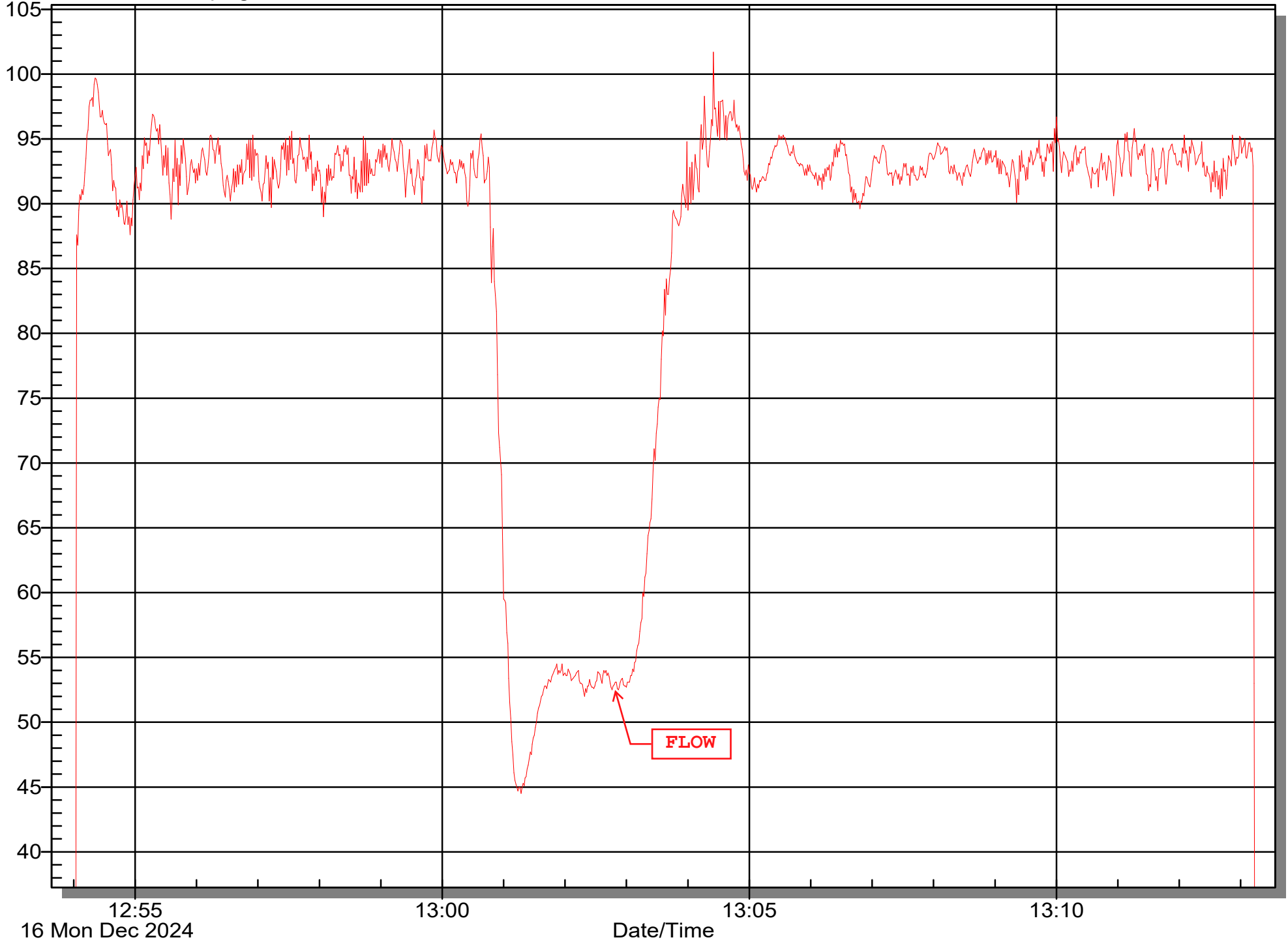
Rated Capacity at 20psi	Class	Marking Color of Hydrant Tops and Nozzles
≥1500 GPM	AA	Light Blue
1000-1499 GPM	A	Green
500-999 GPM	B	Orange
≤499 GPM	C	Red

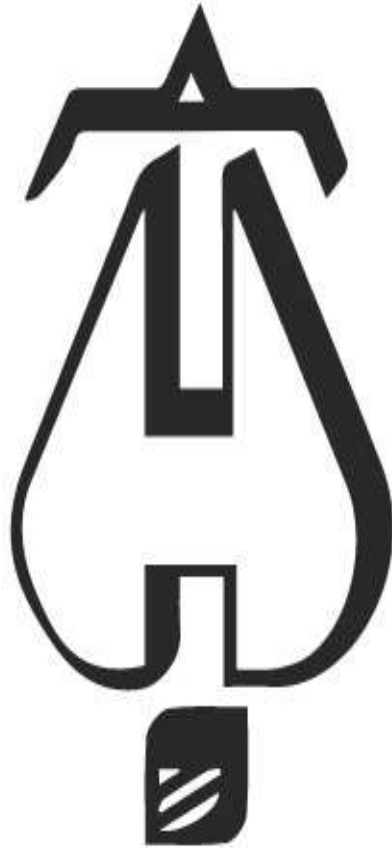
The above are the NFPA hydrant classifications and color marking for various rated capacities. Source NFPA 291, Chapter 5 2019



# 900 Edwards Brothers Drive, Lillington flow test - Monday, December 16, 2024

AKE1-Pressure/psig Min: 0.5 Max: 101.7





## Hydraulic Calculations by HydraCALC

Carolina Fire Protection  
4055 Hodges Chapel Rd.  
Dunn, NC 28334  
910-892-1700

Job Name : KSE Scientific  
Drawing :  
Location : LILLINGTON, NC  
Remote Area : 1  
Contract : 24L977  
Data File : kse.WXF

Hydraulic Design Information Sheet

Name - KSE SCIENTIFIC Date - 02/19/2025  
 Location - LILLINGTON, NC  
 Building - System No. - 1  
 Contractor - Carolina Fire Protection Contract No. - 24L977  
 Calculated By - Austin Lee Drawing No. -  
 Construction: (X) Combustible ( ) Non-Combustible Ceiling Height - 10'-0"  
 Occupancy - Ordinary Hazard

S (X) NFPA 13 ( ) Lt. Haz. Ord.Haz.Gp. ( ) 1 (X) 2 ( ) 3 ( ) Ex.Haz.  
 Y ( ) NFPA 231 ( ) NFPA 231C ( ) Figure Curve

S Other

T Specific Ruling Made By Date

M	Area of Sprinkler Operation - 1052	System Type	Sprinkler/Nozzle
	Density - .20	(X) Wet	Make Victaulic
D	Area Per Sprinkler - 130	( ) Dry	Model V5606
E	Elevation at Highest Outlet - 10	( ) Deluge	Size 1/2"
S	Hose Allowance - Inside - N/A	( ) Preaction	K-Factor 5.6
I	Rack Sprinkler Allowance - N/A	( ) Other	Temp.Rat.155
G	Hose Allowance - Outside - 250		

N Note

Calculation Flow Required - 340.66 Press Required - 56.099 BOR  
 Summary C-Factor Used: 120 Overhead 140 Underground

W	Water Flow Test:	Pump Data:	Tank or Reservoir:
A	Date of Test - 12-16-2024		Cap. -
T	Time of Test - 1PM	Rated Cap.-	Elev.-
E	Static Press - 93	@ Press -	
R	Residual Press - 53	Elev. -	Well
	Flow - 1700		Proof Flow
S	Elevation - 0		

U  
 P Location - KSE SCIENTIFIC  
 P LILLINGTON, NC  
 L Source of Information - ANDREW KING ENGINEERING, PLLC  
 Y

C	Commodity	Class	Location
O	Storage Ht.	Area	Aisle W.
M	Storage Method:	%	Palletized % Rack
	( ) Single Row	( ) Conven. Pallet	( ) Auto. Storage ( ) Encap.
S	( ) Double Row	( ) Slave Pallet	( ) Solid Shelf ( ) Non
T	( ) Mult. Row		( ) Open Shelf

R K Flue Spacing Clearance:Storage to Ceiling  
 A Longitudinal Transverse

G  
 E Horizontal Barriers Provided:

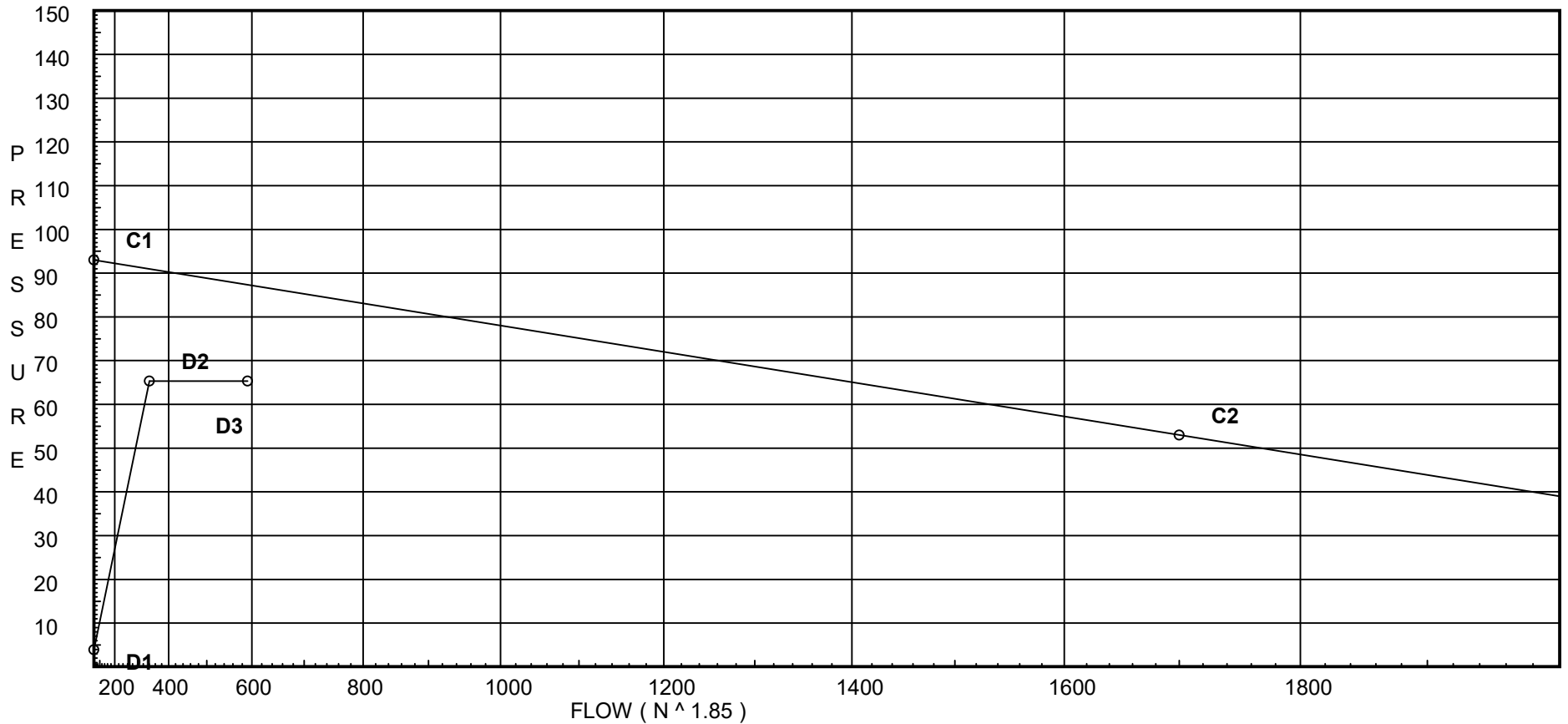
# Water Supply Curve

Carolina Fire Protection  
KSE Scientific

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Date 02/19/2025

City Water Supply:  
C1 - Static Pressure : 93  
C2 - Residual Pressure: 53  
C2 - Residual Flow : 1700

Demand:  
D1 - Elevation : 3.898  
D2 - System Flow : 340.722  
D2 - System Pressure : 65.316  
Hose ( Demand ) : 250  
D3 - System Demand : 590.722  
Safety Margin : 22.025



# Fittings Used Summary

Carolina Fire Protection  
KSE Scientific

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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	
A	Alarm Rel E1 & E3							7.7	21.5		17		27	29								
E	NFPA 13 90' Standard Elbow	0	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61	
G	NFPA 13 Gate Valve	0	0	0	0	0	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13	
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	
Zwd	Watts 709DCDA	Fitting generates a Fixed Loss Based on Flow																				

## 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

Carolina Fire Protection  
KSE Scientific

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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>
TEST	93.0	53	1700.0	87.34	590.72	65.316

## 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>
1A	10.0	5.6	21.5	25.96	0.2 115
2A	10.0	5.6	21.63	26.04	0.2 80
3A	10.0	5.6	21.8	26.15	0.2 115
4A	10.0	5.6	21.97	26.25	0.2 130
5A	10.0	5.6	21.56	26.0	0.2 130
6A	10.0	5.6	21.69	26.08	0.2 130
7A	10.0	5.6	21.87	26.19	0.2 130
8A	10.0	5.6	22.03	26.28	0.2 130
9A	10.0	5.6	21.64	26.05	0.2 130
10A	10.0	5.6	21.79	26.14	0.2 130
11A	10.0	5.6	22.09	26.32	0.2 130
12A	10.0	5.6	22.21	26.39	0.2 130
13A	10.0	5.6	23.04	26.88	0.2 130
1	11.0		31.4		
2	11.0		31.58		
3	11.0		31.84		
4	11.0		32.07		
5	11.0		31.48		
6	11.0		31.67		
7	11.0		31.93		
8	11.0		32.16		
9	11.0		31.6		
10	11.0		31.82		
11	11.0		32.25		
12	11.0		32.42		
13	11.0		33.62		
M1	11.0		33.01		
M2	11.0		33.1		
M3	11.0		33.43		
M4	11.0		34.1		
115	21.0		38.03		
116	21.0		38.02		
117	21.0		38.13		
118	21.0		38.27		
119	21.0		38.38		
120	21.0		38.44		
110	21.0		38.48		
121	21.0		38.5		
122	21.0		38.51		
M5	21.0		38.01		
123	21.0		45.67		
124	21.0		45.68		

# 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>
111	21.0		45.7		
125	21.0		45.74		
126	21.0		45.8		
127	21.0		45.91		
128	21.0		46.05		
129	21.0		46.25		
130	21.0		46.51		
TOR	21.0		47.77		
BOR	1.0		57.64		
U1	1.0		63.8	250.0	
TEST	1.0		65.32		

# Final Calculations : Hazen-Williams

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KSE Scientific

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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	*****
1A to 1	10 11	5.60	25.96 25.96	1 1.049	T Eqv	5.0 43.0	1.000 48.000 49.000	120 0.2109	21.496 -0.433 10.334		Vel = 9.64	
1			0.0 25.96						31.397		K Factor = 4.63	
2A to 2	10 11	5.60	26.04 26.04	1 1.049	T Eqv	5.0 43.0	1.000 48.000 49.000	120 0.2121	21.626 -0.433 10.391		Vel = 9.67	
2			0.0 26.04						31.584		K Factor = 4.63	
3A to 3	10 11	5.60	26.15 26.15	1 1.049	T Eqv	5.0 43.0	1.000 48.000 49.000	120 0.2137	21.804 -0.433 10.470		Vel = 9.71	
3			0.0 26.15						31.841		K Factor = 4.63	
4A to 4	10 11	5.60	26.25 26.25	1 1.049	T Eqv	5.0 43.0	1.000 48.000 49.000	120 0.2151	21.965 -0.433 10.542		Vel = 9.74	
4			0.0 26.25						32.074		K Factor = 4.64	
5A to 5	10 11	5.60	26.00 26.0	1 1.049	T Eqv	5.0 43.0	1.000 48.000 49.000	120 0.2114	21.556 -0.433 10.360		Vel = 9.65	
5			0.0 26.00						31.483		K Factor = 4.63	
6A to 6	10 11	5.60	26.08 26.08	1 1.049	T Eqv	5.0 43.0	1.000 48.000 49.000	120 0.2126	21.686 -0.433 10.418		Vel = 9.68	
6			0.0 26.08						31.671		K Factor = 4.63	
7A to 7	10 11	5.60	26.19 26.19	1 1.049	T Eqv	5.0 43.0	1.000 48.000 49.000	120 0.2142	21.865 -0.433 10.498		Vel = 9.72	
7			0.0 26.19						31.930		K Factor = 4.63	
8A to 8	10 11	5.60	26.28 26.28	1 1.049	T Eqv	5.0 43.0	1.000 48.000 49.000	120 0.2157	22.026 -0.433 10.569		Vel = 9.76	
8			0.0 26.28						32.162		K Factor = 4.63	
9A to 9	10 11	5.60	26.05 26.05	1 1.049	T Eqv	5.0 43.0	1.000 48.000 49.000	120 0.2122	21.637 -0.433 10.396		Vel = 9.67	
9			0.0 26.05						31.600		K Factor = 4.63	
10A to 10	10 11	5.60	26.14 26.14	1 1.049	T Eqv	5.0 43.0	1.000 48.000 49.000	120 0.2136	21.792 -0.433 10.464		Vel = 9.70	



# Final Calculations : Hazen-Williams

Carolina Fire Protection  
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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	*****
10			0.0 26.14						31.823		K Factor = 4.63	
11A to 11	10 11	5.60	26.32 26.32	1 1.049	T Eq	5.0 43.0	1.000 48.000 49.000	120 0.2162	22.085 -0.433 10.595		Vel = 9.77	
11			0.0 26.32						32.247		K Factor = 4.63	
12A to 12	10 11	5.60	26.39 26.39	1 1.049	T Eq	5.0 43.0	1.000 48.000 49.000	120 0.2173	22.205 -0.433 10.649		Vel = 9.80	
12			0.0 26.39						32.421		K Factor = 4.63	
13A to 13	10 11	5.60	26.88 26.88	1 1.049	T Eq	5.0 43.0	1.000 48.000 49.000	120 0.2249	23.040 -0.433 11.018		Vel = 9.98	
13			0.0 26.88						33.625		K Factor = 4.64	
1 to 2	11 11		25.96 25.96	1.5 1.682			8.830 8.830	120 0.0212	31.397 0.0 0.187		Vel = 3.75	
2 to M1	11 11		26.05 52.01	1.5 1.682	T	9.9	8.710 9.900 18.610	120 0.0765	31.584 0.0 1.423		Vel = 7.51	
M1			0.0 52.01						33.007		K Factor = 9.05	
3 to 4	11 11		26.15 26.15	1.5 1.682			10.880 10.880	120 0.0214	31.841 0.0 0.233		Vel = 3.78	
4 to M1	11 11		26.24 52.39	1.5 1.682	T	9.9	2.130 9.900 12.030	120 0.0776	32.074 0.0 0.933		Vel = 7.56	
M1			0.0 52.39						33.007		K Factor = 9.12	
5 to 6	11 11		26.00 26.0	1.5 1.682			8.830 8.830	120 0.0213	31.483 0.0 0.188		Vel = 3.75	
6 to M2	11 11		26.08 52.08	1.5 1.682	T	9.9	8.710 9.900 18.610	120 0.0767	31.671 0.0 1.427		Vel = 7.52	
M2			0.0 52.08						33.098		K Factor = 9.05	
7 to 8	11 11		26.19 26.19	1.5 1.682			10.830 10.830	120 0.0214	31.930 0.0 0.232		Vel = 3.78	
8 to M2	11 11		26.28 52.47	1.5 1.682	T	9.9	2.130 9.900 12.030	120 0.0778	32.162 0.0 0.936		Vel = 7.58	

# Final Calculations : Hazen-Williams

Carolina Fire Protection  
KSE Scientific

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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	*****
M2			0.0 52.47						33.098		K Factor = 9.12	
9 to 10	11 11		26.05 26.05	1.5 1.682			10.500 10.500	120 0.0212	31.600 0.0 0.223		Vel = 3.76	
10 to M3	11 11		26.14 52.19	1.5 1.682	T	9.9	11.000 9.900 20.900	120 0.0770	31.823 0.0 1.609		Vel = 7.54	
M3			0.0 52.19						33.432		K Factor = 9.03	
11 to 12	11 11		26.32 26.32	1.5 1.682			8.000 8.000	120 0.0217	32.247 0.0 0.174		Vel = 3.80	
12 to M3	11 11		26.39 52.71	1.5 1.682	T	9.9	3.000 9.900 12.900	120 0.0784	32.421 0.0 1.011		Vel = 7.61	
M3			0.0 52.71						33.432		K Factor = 9.12	
13 to M4	11 11		26.88 26.88	1.5 1.682	T	9.9	11.000 9.900 20.900	120 0.0225	33.625 0.0 0.471		Vel = 3.88	
M4			0.0 26.88						34.096		K Factor = 4.60	
M1 to M2	11 11		104.40 104.4	3 3.26			8.167 8.167	120 0.0111	33.007 0.0 0.091		Vel = 4.01	
M2 to M3	11 11		104.55 208.95	3 3.26			8.380 8.380	120 0.0399	33.098 0.0 0.334		Vel = 8.03	
M3 to M4	11 11		104.89 313.84	3 3.26			7.833 7.833	120 0.0848	33.432 0.0 0.664		Vel = 12.06	
M4 to M5	11 21		26.88 340.72	3 3.26	2E T	18.815 20.159	44.590 38.974 83.564	120 0.0987	34.096 -4.331 8.246		Vel = 13.10	
M5			0.0 340.72						38.011		K Factor = 55.26	
115 to 130	21 21		40.14 40.14	1.5 1.682	2E 2T	9.9 19.799	149.330 29.699 179.029	120 0.0474	38.026 0.0 8.480		Vel = 5.80	
130			0.0 40.14						46.506		K Factor = 5.89	
116 to 129	21 21		39.49 39.49	1.5 1.682	2E 2T	9.9 19.799	149.330 29.699 179.029	120 0.0460	38.020 0.0 8.230		Vel = 5.70	
129			0.0 39.49						46.250		K Factor = 5.81	

# Final Calculations : Hazen-Williams

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KSE Scientific

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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	*****
117 to 128	21 21		38.70 38.7	1.5 1.682	2E 2T	9.9 19.799	149.330 29.699 179.029	120 0.0443	38.126 0.0 7.928		Vel = 5.59	
128			0.0 38.70						46.054		K Factor = 5.70	
118 to 127	21 21		37.93 37.93	1.5 1.682	2E 2T	9.9 19.799	149.330 29.699 179.029	120 0.0427	38.272 0.0 7.636		Vel = 5.48	
127			0.0 37.93						45.908		K Factor = 5.60	
119 to 126	21 21		37.37 37.37	1.5 1.682	2E 2T	9.9 19.799	149.330 29.699 179.029	120 0.0415	38.376 0.0 7.428		Vel = 5.40	
126			0.0 37.37						45.804		K Factor = 5.52	
120 to 125	21 21		37.00 37.0	1.5 1.682	2E 2T	9.9 19.799	149.330 29.699 179.029	120 0.0407	38.444 0.0 7.292		Vel = 5.34	
125			0.0 37.00						45.736		K Factor = 5.47	
110 to 111	21 21		36.78 36.78	1.5 1.682	2E 2T	9.9 19.799	149.330 29.699 179.029	120 0.0403	38.483 0.0 7.213		Vel = 5.31	
111			0.0 36.78						45.696		K Factor = 5.44	
121 to 124	21 21		36.67 36.67	1.5 1.682	2E 2T	9.9 19.799	149.330 29.699 179.029	120 0.0401	38.502 0.0 7.176		Vel = 5.29	
124			0.0 36.67						45.678		K Factor = 5.43	
122 to 123	21 21		36.65 36.65	1.5 1.682	2E 2T	9.9 19.799	149.330 29.699 179.029	120 0.0400	38.507 0.0 7.166		Vel = 5.29	
123			0.0 36.65						45.673		K Factor = 5.42	
115 to 116	21 21		-40.14 -40.14	4 4.26			12.000 12.000	120 -0.0005	38.026 0.0 -0.006		Vel = 0.90	
116 to M5	21 21		-39.49 -79.63	4 4.26			5.000 5.000	120 -0.0018	38.020 0.0 -0.009		Vel = 1.79	
M5 to 117	21 21		340.72 261.09	4 4.26			7.000 7.000	120 0.0164	38.011 0.0 0.115		Vel = 5.88	
117 to 118	21 21		-38.70 222.39	4 4.26			12.000 12.000	120 0.0122	38.126 0.0 0.146		Vel = 5.01	

# Final Calculations : Hazen-Williams

Carolina Fire Protection  
KSE Scientific

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Date 02/19/2025

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	*****
118 to 119	21 21		-37.93 184.46	4 4.26			12.000 12.000	120 0.0087	38.272 0.0 0.104			Vel = 4.15
119 to 120	21 21		-37.37 147.09	4 4.26			12.000 12.000	120 0.0057	38.376 0.0 0.068			Vel = 3.31
120 to 110	21 21		-36.99 110.1	4 4.26			12.000 12.000	120 0.0032	38.444 0.0 0.039			Vel = 2.48
110 to 121	21 21		-36.78 73.32	4 4.26			12.000 12.000	120 0.0016	38.483 0.0 0.019			Vel = 1.65
121 to 122	21 21		-36.67 36.65	4 4.26			12.000 12.000	120 0.0004	38.502 0.0 0.005			Vel = 0.82
122			0.0 36.65						38.507			K Factor = 5.91
123 to 124	21 21		36.65 36.65	4 4.26			12.000 12.000	120 0.0004	45.673 0.0 0.005			Vel = 0.82
124 to 111	21 21		36.67 73.32	4 4.26			12.000 12.000	120 0.0015	45.678 0.0 0.018			Vel = 1.65
111 to 125	21 21		36.78 110.1	4 4.26			12.000 12.000	120 0.0033	45.696 0.0 0.040			Vel = 2.48
125 to 126	21 21		36.99 147.09	4 4.26			12.000 12.000	120 0.0057	45.736 0.0 0.068			Vel = 3.31
126 to 127	21 21		37.37 184.46	4 4.26			12.000 12.000	120 0.0087	45.804 0.0 0.104			Vel = 4.15
127 to 128	21 21		37.93 222.39	4 4.26			12.000 12.000	120 0.0122	45.908 0.0 0.146			Vel = 5.01
128 to 129	21 21		38.70 261.09	4 4.26			12.000 12.000	120 0.0163	46.054 0.0 0.196			Vel = 5.88
129 to 130	21 21		39.50 300.59	4 4.26			12.000 12.000	120 0.0213	46.250 0.0 0.256			Vel = 6.77
130 to TOR	21 21		40.13 340.72	4 4.26	E	13.167	34.000 13.167 47.167	120 0.0268	46.506 0.0 1.264			Vel = 7.67
TOR to BOR	21 1		0.0 340.72	4 4.26	A G	22.384 2.633	20.000 25.017 45.017	120 0.0268	47.770 8.662 1.208			Vel = 7.67
BOR to U1	1 1		0.0 340.72	6 6.357	2E Zwd	35.205 0.0	6.000 35.205 41.205	120 0.0038	57.640 6.000 0.157		** Fixed Loss = 6	Vel = 3.44

# Final Calculations : Hazen-Williams

Carolina Fire Protection  
KSE Scientific

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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	*****
U1 to TEST	1 1	H250	250.00 590.72	6 6.16	2E T G	40.168 43.037 4.304	76.500 87.509 164.009	140 0.0093	63.797 0.0 1.519		Vel = 6.36	
TEST			0.0 590.72						65.316		K Factor = 73.09	