LKC Engineering, PLLC
140 Aqua Shed Court
Aberdeen, NC 28315
PH: (910) 420-1437
FAX: (910) 637-0096
License #P-1095

FIRE FLOW TEST RESULTS:

Test Number	1
Test Date & Time	12/1/2020 - 10:30
Client	
Location	Johnsonville Elementary School
Performed by	J Maples, Logan willams Sam Tracy

Static Pressure	77	psi	Location: Hwy 24 & Hwy 27 Infront of Self Storage
Residual Pressure	69	psi	Location:
Nozzle inside Diameter		inches	(measure nozzle used)
Pitot Tube Pressure	24	psi	Location: Infront of School (hydrant #18,495)
Discharge rate (measured)	840	gpm	Flow Measuring Device: PollardWater Pitot Gauge
Required Residual Pressure	30	psi	(varies - 20psi minimum)

Formula: $Q_R = Q_F \times \left(H_R / H_F\right)^{0.54}$

Q(n) = Rated Capacity (in gpm) at 20 psi residual
Q(r) = Total test flow (gpm) from at pitot pressure
H(n) = Static Pressure - 20psi
H(r) = Static Pressure - Residual Pressure

Q(n) =	840	47	8
	Q(r)	H(n)	H(r)

Available Fire Flow Q(n) = **2,185** gpm at 30 psi residual

Performed By: Jackson Maples 12/1/2020 Date

Certified By: Date

Notes: Residual hydrant #19,590 (hydrant #'s taken from Harnett County GIS)

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FIRE FLOW TEST RESULTS:

Test Number	1
Test Date & Time	12/1/2020 - 10:30
Client	
Location	Johnsonville Elementary School
Performed by	J Maples, Logan willams Sam Tracy

Static Pressure	104	psi	Location: Hwy 87 & Hwy 27 intersection
Residual Pressure	76	psi	Location:
Nozzle inside Diameter		inches	(measure nozzle used)
Pitot Tube Pressure	24	psi	Location: Infront of School (hydrant #18,495)
Discharge rate (measured)	840	gpm	Flow Measuring Device: PollardWater Pitot Gauge
Required Residual Pressure	30	psi	(varies - 20psi minimum)

Formula: $Q_R = Q_F \times \left(H_R / H_F\right)^{0.54}$

Q(n) = Rated Capacity (in gpm) at 20 psi residual
Q(r) = Total test flow (gpm) from at pitot pressure
H(n) = Static Pressure - 20psi
H(r) = Static Pressure - Residual Pressure

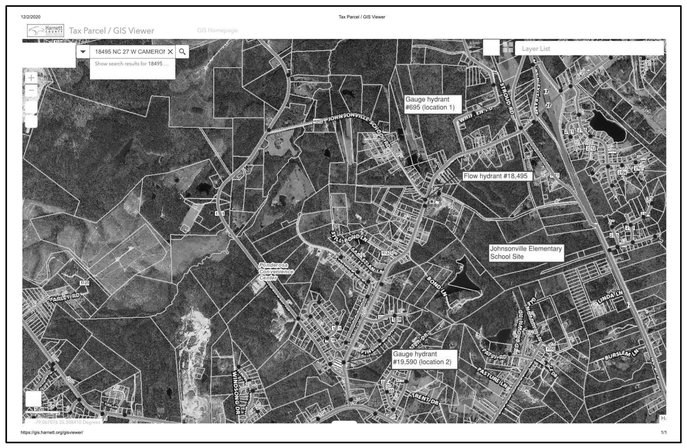
Q(n) =	840	74	28
	Q(r)	H(n)	H(r)

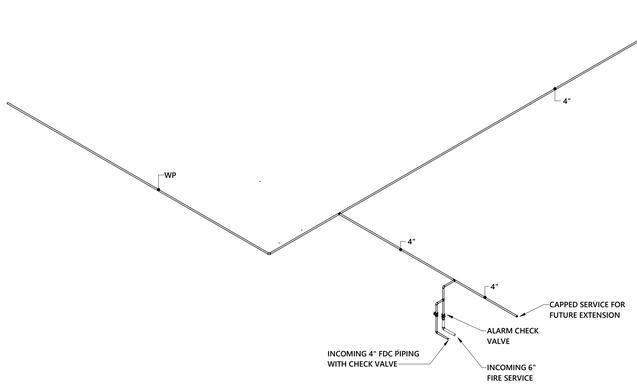
Available Fire Flow Q(n) = **1,420** gpm at 30 psi residual

Performed By: Jackson Maples 12/1/2020 Date

Certified By: Date

Notes: Residual hydrant #695 (hydrant #'s taken from Harnett County GIS)





3 FIRE PROTECTION RISER DIAGRAM

FIRE PROTECTION SPECIFICATIONS

GENERAL REQUIREMENTS:

1. THE INTENT OF THESE PLANS IS TO PROVIDE INFORMATION TO THE REVIEWING AUTHORITIES THAT THE BUILDING WILL BE PROTECTED BY AUTOMATIC SPRINKLER SYSTEMS. THE INFORMATION INCLUDED WITHIN THESE DOCUMENTS IS PROVIDED FOR COORDINATION AND AS A REFERENCE ONLY AND THESE DOCUMENTS SHALL NOT BE CONSIDERED ACTUAL DESIGN OR CONSTRUCTION DOCUMENTS.
2. PROVIDE DESIGN, FABRICATION, AND INSTALLATION OF HYDRAULICALLY CALCULATED AUTOMATIC SPRINKLER SYSTEMS. INCLUDE ALL SERVICES, MATERIALS, LABOR, AND EQUIPMENT REQUIRED FOR COMPLETE WORKING SYSTEMS. DESIGN AND INSTALL AUTOMATIC SPRINKLER SYSTEMS IN FULL COMPLIANCE WITH THE LATEST EDITIONS OF NFPA 13, THE NORTH CAROLINA FIRE PREVENTION CODE, THE OWNER'S INSURANCE UNDERWRITER, AND THE LOCAL AUTHORITY HAVING JURISDICTION.
3. PROVIDE SHOP DRAWINGS AND HYDRAULIC CALCULATIONS FOR REVIEW BY THE AUTHORITY HAVING JURISDICTION INCLUDING, BUT NOT LIMITED TO, ALL REQUIRED ITEMS AS OUTLINED IN NFPA 13 "PLANS AND CALCULATIONS: SECTIONS. SHOP DRAWINGS MUST BE PREPARED BY A NICET LEVEL III (OR HIGHER) TECHNICIAN CERTIFIED IN WATER-BASED SYSTEMS LAYOUT. INCLUDE DESIGNER'S NAME, SIGNATURE, AND CERTIFICATION NUMBER ON EACH PLAN SHEET OF THE SHOP DRAWING PACKAGE AND ON THE COVER SHEET OF EACH HYDRAULIC CALCULATION. THE HYDRAULIC CALCULATIONS SHALL BE BASED ON THE ACTUAL MANUFACTURER'S PRODUCT DATA INTENDED FOR INSTALLATION IN THE SYSTEMS AND NOT STANDARD VALUES FROM CALCULATION SOFTWARE.
4. THE CONTRACTOR SHALL PERFORM A FIRE FLOW TEST IN ACCORDANCE WITH NFPA 291 UTILIZING TEST AND FLOW HYDRANTS LOCATED ACROSS THE UTILITY CONNECTION INDICATED ON THE SITE UTILITIES PLAN PRIOR TO BEGINNING DESIGN. THE CONTRACTOR'S FIRE FLOW TEST DATA SHALL BE INCLUDED IN THE HYDRAULIC CALCULATIONS PROVIDED IN THE SHOP DRAWING PACKAGE. FIRE FLOW TEST DATA OLDER THAN ONE YEAR WILL NOT BE ACCEPTED. COORDINATE WITH THE OWNER AND LOCAL UTILITY PRIOR TO PERFORMING ANY FIRE FLOW TESTS.
5. EXAMINE THE CONSTRUCTION DOCUMENTS INCLUDING ANY SPECIFICATIONS OR PROJECT MANUALS. REVIEW THE PROJECT CONDITIONS AND VERIFY ALL MEASUREMENTS, DISTANCES, ELEVATIONS, CLEARANCES, PIPE SIZES, ETC. PRIOR TO THE START OF CONSTRUCTION. COORDINATE THE LOCATION OF SPRINKLERS WITH THE ARCHITECTURAL CEILING PLANS AND THE WORK OF OTHER TRADES. PROVIDE ADDITIONAL SPRINKLERS IN ORDER TO COORDINATE WITH LUMINAIRES. ANY CHANGES OR ALTERATIONS REQUIRED DUE TO A LACK OF COORDINATION SHALL BE THE CONTRACTOR'S RESPONSIBILITY.
6. PROVIDE ALL NECESSARY OFFSETS, RISES, OR DROPS IN THE PIPING AND ASSOCIATED AUXILIARY DRAINS AS REQUIRED BY NFPA 13.
7. FIRESTOP ALL PENETRATIONS OF FIRE-RATED WALLS, FLOORS, AND PARTITIONS. PROVIDE A DEVICE OR SYSTEM WHICH HAS BEEN TESTED AND LISTED AS COMPLYING WITH ASTM E814 AND INSTALL IN ACCORDANCE WITH THE CONDITIONS OF THE LISTING. PROVIDE A DEVICE OR SYSTEM WITH AN F-RATING EQUAL TO THE RATING OF THE ASSEMBLY BEING PENETRATED. REFER TO ARCHITECTURAL PLANS FOR WALL AND FLOOR TYPES.
8. FLUSH AND TEST SYSTEM PIPING IN ACCORDANCE WITH NFPA 13.
9. AT THE COMPLETION OF THE PROJECT, PROVIDE TO THE OWNER TWO SETS OF RECORD DRAWINGS WHICH CLEARLY SHOW ANY CHANGES AND/OR MODIFICATIONS, ADDITIONS, OR DELETIONS OF THE CONSTRUCTION DOCUMENTS.
10. AT THE COMPLETION OF THE PROJECT, PROVIDE TO THE OWNER ALL EXTRA STOCK REQUIRED BY NFPA 13.
11. THE CONTRACTOR SHALL GUARANTEE ALL WORK, MATERIALS, AND EQUIPMENT FURNISHED AGAINST DEFECTS, LEAKS, PERFORMANCE, AND NONOPERATION FOR A PERIOD OF ONE (1) YEAR AFTER THE DATE OF THE OWNER'S FINAL ACCEPTANCE. DEFECTS SHALL BE INTERPRETED AS DEFECTIVE MATERIALS OR EQUIPMENT OR UNSATISFACTORY INSTALLATION AND ARE NOT INTENDED TO APPLY TO ORDINARY WEAR AND TEAR. THE CONTRACTOR SHALL PAY FOR ANY REPAIRS OR REPLACEMENTS CAUSED BY THESE DEFECTS WITHIN THE PERIOD COVERED BY THE GUARANTEE, INCLUDING ALL INCIDENTAL WORK REQUIRED TO FIX THE DEFICIENCY.

MATERIALS:

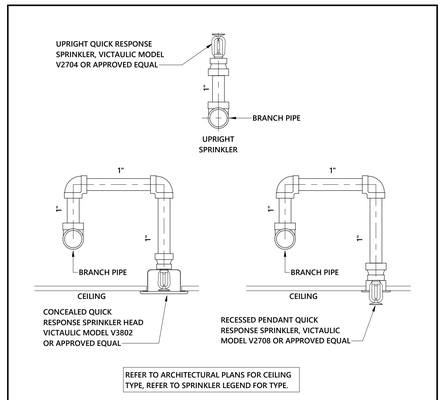
1. PROVIDE UL LISTED BLACK STEEL PIPING (ASTM A53, ASTM A135, OR ASTM A795) WITH AN FM APPROVED MIC-INHIBITING COATING. PIPING 1-1/2" IN DIAMETER AND SMALLER SHALL BE SCHEDULE FORTY BLACK STEEL PIPE WITH THREADED OR WELDED FITTINGS. PIPING 2" IN DIAMETER AND LARGER SHALL BE SCHEDULE TEN BLACK STEEL PIPE ROLL-GROOVED FOR MECHANICAL FITTINGS.
2. PROVIDE UL LISTED STANDARD WEIGHT CAST IRON OR MALLEABLE IRON FITTINGS FOR PRESSURES UP TO 175 PSI. PROVIDE EXTRA HEAVY WEIGHT CAST IRON OR MALLEABLE IRON FITTINGS FOR PRESSURES OVER 175 PSI. THREADED CAST IRON FITTINGS SHALL MEET ASME B16.4. THREADED MALLEABLE IRON FITTINGS SHALL MEET ASME B16.3. GROOVED FITTINGS AND COUPLINGS SHALL BE UL LISTED DUCTILE IRON UTILIZING AN EPDM GASKET. PLAIN-END FITTINGS AND COUPLINGS OR WELDED-SEGMENTED FITTINGS ARE PROHIBITED. BUSHINGS OR GROOVED-END REDUCING COUPLINGS SHALL NOT BE USED UNLESS STANDARD REDUCING FITTINGS ARE NOT REGULARLY AVAILABLE.
3. SUPPORT PIPING IN ACCORDANCE WITH NFPA 13.
4. PROVIDE ORDINARY AND INTERMEDIATE TEMPERATURE SPRINKLERS THROUGHOUT. PROVIDE CONCEALED PENDENT SPRINKLERS IN AREAS WITH CEILINGS. PROVIDE UPRIGHT SPRINKLERS IN AREAS WITH EXPOSED STRUCTURE. PROVIDE SIDEWALL SPRINKLERS IN ACCORDANCE WITH THE REQUIREMENTS OF NFPA 13. QUICK RESPONSE SPRINKLERS SHALL BE INSTALLED IN ALL LIGHT HAZARD AREAS IN ACCORDANCE WITH NFPA 13. WHERE QUICK RESPONSE SPRINKLERS ARE INSTALLED IN A COMPARTMENT, THEY SHALL BE INSTALLED THROUGHOUT THE COMPARTMENT. COORDINATE SPRINKLER AND ESCUTCHEON OR COVER PLATE FINISHES WITH ADJACENT FINISHES AS INDICATED ON THE ARCHITECTURAL PLANS. IN GENERAL, ALL PENDENT AND SIDEWALL SPRINKLERS AND COVER PLATES SHALL HAVE A WHITE ENAMEL FINISH.
5. PROVIDE OS&Y CONTROL VALVES, IRON BODY, BRONZE MOUNTED, DOUBLE DISC WITH PARALLEL SEATS, AND/OR; BUTTERFLY, LUG TYPE, DUCTILE IRON BODY, STAINLESS STEEL STEM, ALUMINUM BRONZE DISC, PHENOLIC RING AND BUNA-N SEAT. VALVES SHALL BE UL LISTED FOR FIRE PROTECTION SERVICE.
6. PROVIDE ALL PIPELINE-INSTALLED ALARM INITIATING AND NOTIFICATION DEVICES REQUIRED BY NFPA 13. COORDINATE DEVICE QUANTITIES AND LOCATIONS WITH THE FIRE ALARM CONTRACTOR PRIOR TO DESIGN AND INSTALLATION.
7. PROVIDE ESCUTCHEONS WHERE PIPES PASS EXPOSED THROUGH WALLS, FLOORS, OR CEILINGS. COORDINATE COLOR WITH ADJACENT FINISHES AS INDICATED ON THE ARCHITECTURAL PLANS.
8. PROVIDE ALL SIGNAGE AS REQUIRED BY NFPA 13.

COORDINATION DRAWINGS

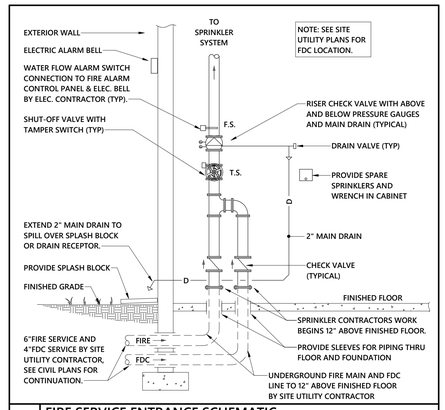
THE MECHANICAL CONTRACTOR SHALL ORGANIZE COORDINATION MEETINGS TO DEVELOP A SET OF COORDINATION DRAWINGS WITH ALL CONTRACTORS (ELECTRICAL, MECHANICAL, PLUMBING, FIRE PROTECTION, IT/DATA, AND GENERAL CONTRACTOR). THE MECHANICAL CONTRACTOR WILL HAVE THE LEAD RESPONSIBILITY FOR THE COORDINATION DRAWINGS. THE MECHANICAL CONTRACTOR SHALL PRODUCE THE ORIGINAL DRAWINGS AND FORWARD THE DRAWINGS TO EACH OF THE OTHER CONTRACTORS FOR THEM TO ADD THEIR SYSTEMS TO THE SET OF COORDINATION DRAWINGS. THE CONTRACTORS WILL DEVELOP THE DRAWINGS IN THIS ORDER: MECHANICAL, FIRE PROTECTION, PLUMBING, ELECTRICAL, IT/DATA, AND GENERAL. THIS SHALL ALSO BE THE ORDER OF PRECEDENCE FOR INSTALLATION OF SYSTEMS. ANY RELOCATION OF SYSTEM ROUTINGS WILL BE FOUND IN THE COORDINATION PHASE AND NOTICED BY EACH OF THE CONTRACTORS. THESE DRAWINGS, WHEN COMPLETED, SHALL BE SIGNED OFF BY ALL OF THE ABOVE LISTED PARTIES. DRAWINGS SHALL BE COMPLETED PRIOR TO FABRICATION AND INSTALLATION OF DUCTWORK AND PIPING SYSTEMS, OR PURCHASE OF EQUIPMENT. THE FOLLOWING ITEMS REPRESENT THE MINIMUM REQUIREMENTS OF COORDINATION DRAWINGS:

1. ALL COORDINATION DRAWINGS WILL BE PRODUCED AT 1/4" = 1'-0 SCALE.
2. DRAWINGS WILL BE ORIGINAL DRAWINGS AND NOT OVERLAYS OF THE CONTRACT/DESIGN DRAWINGS.
3. COORDINATION DRAWINGS ARE NOT SHOP DRAWINGS AND ARE REQUIRED IN ADDITION TO SHOP DRAWINGS.
4. ONCE THE COMPLETE COORDINATION DRAWINGS HAVE BEEN COMPILED, THE MECHANICAL CONTRACTOR WILL DISTRIBUTE ONE SIGNED SET TO EACH OF THE FOLLOWING CONTRACTORS: ELECTRICAL, PLUMBING, FIRE PROTECTION, AND GENERAL. ADDITIONAL SETS WILL BE SENT TO THE OWNER, ARCHITECT, AND ENGINEER.

THE USE OF BUILDING INFORMATION MODELING (BIM) THROUGHOUT THE CONSTRUCTION PROCESS IS A REQUIREMENT FOR THIS PROJECT TO HELP REDUCE OR ELIMINATE FIELD-DETECTED CONFLICTS, IMPROVE CONSTRUCTION QUALITY AND MAINTAIN AN AGGRESSIVE SCHEDULE. THE CONTRACTOR WILL BE RESPONSIBLE FOR CREATING THE MODEL AND MANAGING THE COORDINATION AND COLLISION DETECTION PROCESS. THE MODEL MUST CONTAIN COMPLETE ARCHITECTURAL, STRUCTURAL, MECHANICAL, ELECTRICAL, PLUMBING AND FIRE PROTECTION SYSTEMS CONSISTENT WITH THE DESIGN AND FABRICATION DRAWINGS.



2 TYPICAL RETURN BEND SCHEMATIC
NOT TO SCALE



1 FIRE SERVICE ENTRANCE SCHEMATIC
NOT TO SCALE

FIRE PROTECTION LEGEND

NEW PIPING	DESCRIPTION
	WET PIPE SYSTEM PIPING
	ELBOW DOWN
	ELBOW UP
	TEE DOWN
	PIPE CONTINUES
	PIPE CAP (OR PLUG)
	CONTROL VALVE WITH TAMPER SWITCH
	CHECK VALVE

ADDITIONAL ABBREVIATIONS

ABOVE FINISH CEILING	AFC	INCH	"
ABOVE FINISH FLOOR	AFF	KILOWATT	KW
ABOVE FINISH GRADE	AFG	MAXIMUM	MAX
AUTHORITY HAVING JURISDICTION	AHJ	MINIMUM	MIN
BACKFLOW PREVENTER	BFP	NOT IN CONTRACT	NIC
BELOW FINISH CEILING	BFC	NOT TO SCALE	NTS
BELOW FINISH FLOOR	BFF	POUND	LB
BELOW FINISH GRADE	BFG	POUNDS PER SQUARE INCH	PSI
DEGREE	°	REDUCED PRESSURE DETECTOR ASSEMBLY	RPDA
DEGREES FAHRENHEIT	°F	REVOLUTIONS PER MINUTE	RPM
DIAMETER, NOMINAL	DIA	SQUARE FEET	SF
DIFFERENCE	Δ	TYPICAL	TYP
DOWN	DN		
FOOT OR FEET	'	ELECTRICAL CONTRACTOR	EC
FEET OF HEAD	FT-HD	FIRE ALARM CONTRACTOR	FC
GALLONS	GAL	GENERAL CONTRACTOR	GC
GALLONS PER MINUTE	GPM	MECHANICAL CONTRACTOR	MC
HORSEPOWER	HP	PLUMBING CONTRACTOR	PC
HERTZ	HZ	SPRINKLER CONTRACTOR	SC

DESIGN DATA

LIGHT HAZARD OCCUPANCY (ALL AREAS NOT SPECIFICALLY DESIGNATED "OH-1" OR "OH-2"):

DESIGN DENSITY:	0.10 GPM/SF
WET PIPE HYDRAULICALLY MOST REMOTE AREA:	1,500 SF
SPRINKLER ORIFICE SIZE:	1/2"
MAXIMUM COVERAGE AREA PER SPRINKLER:	225 SF
DURATION OF WATER SUPPLY:	30 MINUTES
TOTAL COMBINED HOSE STREAM ALLOWANCE:	100 GPM

ORDINARY HAZARD, GROUP I OCCUPANCY (AREAS DESIGNATED "OH-1"):

DESIGN DENSITY:	0.15 GPM/SF
WET PIPE HYDRAULICALLY MOST REMOTE AREA:	1,500 SF
SPRINKLER ORIFICE SIZE:	1/2"
MAXIMUM COVERAGE AREA PER SPRINKLER:	130 SF
DURATION OF WATER SUPPLY:	60 - 90 MINUTES
TOTAL COMBINED HOSE STREAM ALLOWANCE:	250 GPM

ORDINARY HAZARD, GROUP II OCCUPANCY (AREAS DESIGNATED "OH-2"):

DESIGN DENSITY:	0.20 GPM/SF
WET PIPE HYDRAULICALLY MOST REMOTE AREA:	1,500 SF
SPRINKLER ORIFICE SIZE:	1/2"
MAXIMUM COVERAGE AREA PER SPRINKLER:	130 SF
DURATION OF WATER SUPPLY:	60 - 90 MINUTES
TOTAL COMBINED HOSE STREAM ALLOWANCE:	250 GPM

FIRE PROTECTION SHEET INDEX

SHEET	TITLE
FP1-001	FIRE PROTECTION LEGEND, DESIGN DATA, AND SPECIFICATIONS
FP1-101	FIRE PROTECTION PLAN - NEW WORK

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NORTH CAROLINA PROFESSIONAL SEAL 042014 ENGINEER EUGENE S. DREW 1/28/22

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Phone: 919-926-2200 - www.optimaengineering.com
North Carolina License Number C-0914

Harnett County Schools

Johnsonville Elementary School Addition/Renovation Phase 2

18495 NC-27, Cameron, NC 28326

ENERGY STAR PARTNER

No.	Date	Description

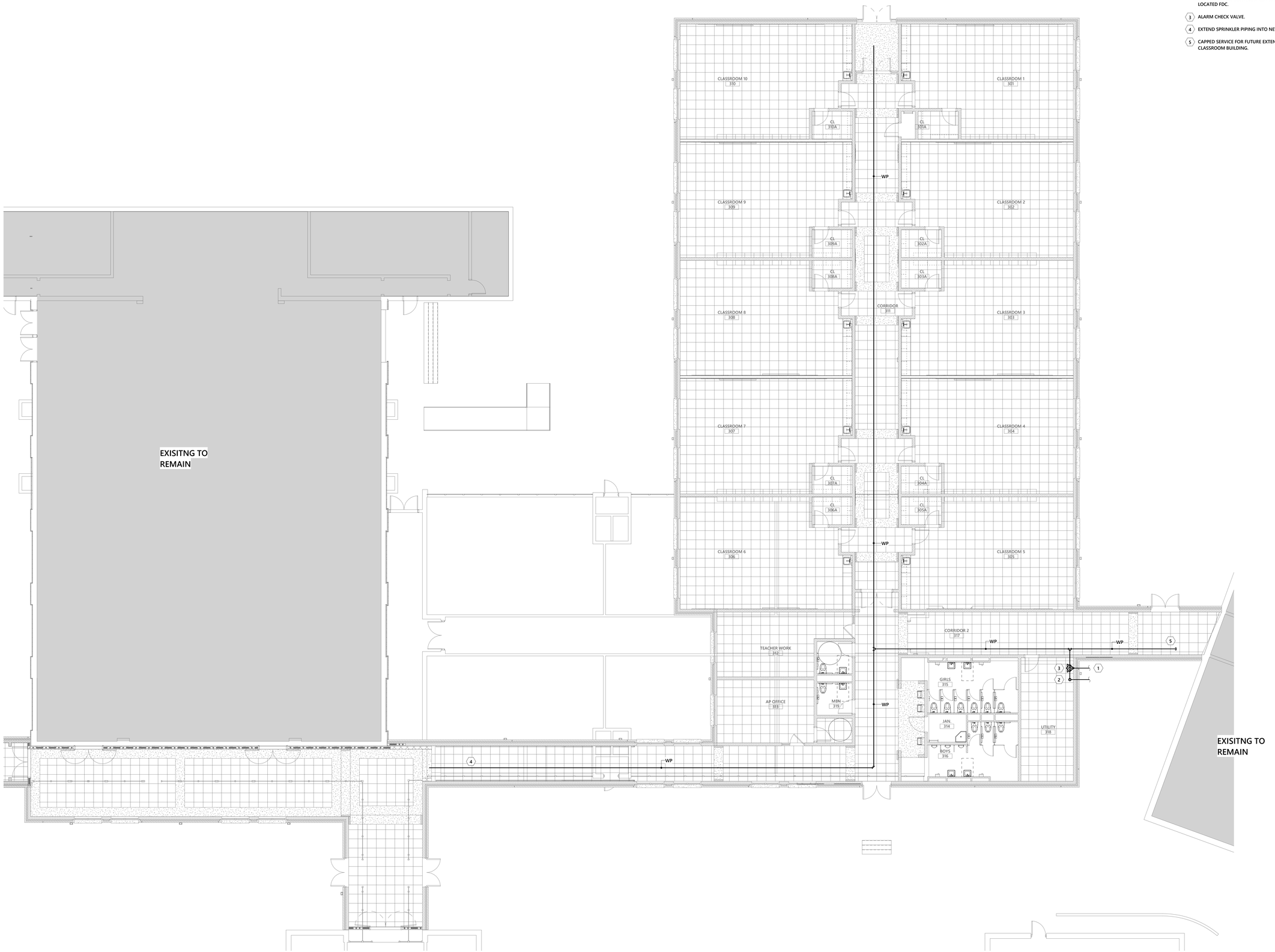
ISSUE DATE: 01/28/2022
PROJECT #: 02103.000
DRAWN BY: CAW
CHECKED BY: ESD

FIRE PROTECTION LEGEND, DESIGN DATA, AND SPECIFICATIONS

FP1-001

Sheet No. 1 of 2

OPTIMA # 21-0266R



1 FIRST FLOOR FIRE PROTECTION PLAN - PHASE 2
1/8" = 1'-0"

KEYED NOTES:

1. INCOMING 6" FIRE SERVICE. SEE SITE/CIVIL DRAWINGS FOR CONTINUATION.
2. INCOMING 4" FDC PIPING WITH CHECK VALVE. SEE SITE/CIVIL DRAWINGS FOR CONTINUATION AND LOCATION OF SITE-LOCATED FDC.
3. ALARM CHECK VALVE.
4. EXTEND SPRINKLER PIPING INTO NEW CORRIDOR.
5. CAPPED SERVICE FOR FUTURE EXTENSION INTO EXISTING CLASSROOM BUILDING.

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FIRE PROTECTION PLAN - NEW WORK

FP1-101

Sheet No. 2 of 2

OPTIMA # 21-0266R