

REPORT

SOUTH KINGSTOWN HIGH SCHOOL

Fire Protection and Fire Alarm Basis of Design Narrative



PREPARED FOR

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1.0 Introduction

Jensen Hughes has prepared this document to outline the scope of work associated with the fire alarm system and the automatic sprinkler system installation for the new South Kingstown High School Building to be constructed at 215 Columbia Street in South Kingstown, Rhode Island. This narrative describes both the fire alarm and fire protection systems information and design criteria necessary to provide a new, code compliant systems throughout the building.

2.0 Primary Design Assumptions

The proposed South Kingstown High School building is a 3-Story mixed-use Occupancy as defined by the *Rhode Island State Building Code* (RISBC) and the *Rhode Island Life Safety Code* (RILSC). The following summarizes the general building features:

1. The building is classified as Type IB construction in accordance with the RISBC.
2. The following occupancy use groups are expected to be present: A-1, Assembly (Auditorium); A-2, Assembly (Cafeteria/Kitchen); A-3, Assembly (Gymnasium); B, Business (Offices); E, Educational (Classrooms); I, Industrial (Vocational Classrooms); S-1, Storage (Moderate Hazard Storage Rooms); S-2, Storage (MEP, Building Support and Service)
3. The building measures approximately 180,000 gross square feet and is 3 stories in height above grade.
4. The building is not classified as a high-rise.
5. The new fire alarm system will be an addressable emergency voice communication/evacuation system.
6. The building will be provided with full automatic sprinkler protection by a wet-pipe sprinkler system in accordance with the provisions of NFPA 13.
7. All areas of the building, other than walk-in coolers and freezers, will be maintained above 40 °F at all times.
8. A manual standpipe system will be required if the vertical distance between the uppermost floor and the lowest level of fire department access exceeds 30 feet.
9. All new fire alarm system circuitry shall be installed Class A and shall meet the color code requirements outlined within the Rhode Island Fire Safety Code.
10. Calculations for all new visual notification appliance circuits will be provided by the installing contractor to ensure proper functionality. Quantities and locations of remote power supplies are the responsibility of the installing contractor.
11. Calculations for all digital audio amplifiers and audible notification appliance circuits will be provided by the installing contractor to ensure proper functionality. The quantities and locations of amplifiers are the responsibility of the installing contractor.
12. Battery calculations for all control equipment will be provided to ensure sufficient backup battery capacity.
13. The fire alarm contractor shall be responsible for coordinating the engineer's pre-acceptance test and final acceptance test with the South Kingstown Fire Department.

3.0 Applicable Laws, Regulations, and Standards

The automatic fire sprinkler and fire alarm systems will be designed and installed in accordance with the applicable provisions of the following codes and standards:

1. IBC (2018) - *The International Building Code* as amended by the *Rhode Island State Building Code* (RISBC)
2. Rhode Island State Fire Code (RIFC) – National Fire Protection Association (NFPA) Standard 1-2018, “Fire Code”, as amended by Section 7 of the Rhode Island Fire Safety Code.
3. Rhode Island State Life Safety Code (RILSC) – NFPA 101-2018, “Life Safety Code”, as amended by Section 8 of the Rhode Island Fire Safety Code.
4. NFPA 13, “*Standard for the Installation of Sprinkler Systems*”, 2016 Edition.
5. NFPA 14, “*Standard for the Installation of Standpipe and Hose Systems*” 2016 Edition
6. NFPA 25, “*Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*”, 2017 Edition.
7. NFPA 70, “*National Electrical Code*”, 2020 Edition.
8. NFPA 72, “*National Fire Alarm Code*”, 2019 Edition.
9. All applicable standards referenced by the RIFC and RILSC.

4.0 Design Responsibility for Fire Protection System

The Professional Engineer (P.E.) from Jensen Hughes will specify the design criteria to be used by the installing contractor who will finalize the system layout and confirm the design criteria (working plans). The P.E. from Jensen Hughes will be considered the Engineer of Record (EofR). Jensen Hughes will review the system installation for code compliance periodically during construction and will certify the system installation for general conformance with the construction documents at completion.

5.0 Automatic Sprinkler System

5.1 WATER SUPPLY

On September 12, 2024, at 9:30am, a hydrant flow test was conducted by Jensen Hughes and Veolia Water using the existing 12-inch water main at Columbia Street. A summary of the flow test data is provided in Table 1.

Table 1: South Kingstown High School Flow Test Data

<i>Location</i>	Columbia Street
<i>Static Pressure</i>	80 psi
<i>Residual Pressure</i>	77 psi
<i>Flow</i>	643 gpm

The new automatic sprinkler system will be supplied with a 6-inch ductile iron fire service. The fire service will enter the building within the mechanical room and will be equipped with a backflow prevention assembly. It does not appear that a fire pump is required to supplement the municipal water supply.

5.2 OVERALL SYSTEM INFRASTRUCTURE

The intent of this project is to provide code compliant sprinkler protection throughout the entire building via a wet-pipe sprinkler system. The elevator shaft and elevator machine room shall be non-sprinklered as permitted by the RILSC. All new sprinklers installed will be quick response sprinklers. The new sprinklers will be a combination of upright and pendent sprinklers as identified on the design drawings. Dry pendent sprinklers shall be installed as shown on the design drawings to protect the walk-in freezers and coolers in the main kitchen. Sprinkler guards are to be installed as shown on the design drawings. A new Class I manual wet standpipe system shall be provided in the building with 2 ½" hose connections at each main interior exit stair landing. A fire department connection (FDC) shall be installed as shown on the site plan. The FDC shall be a 5-inch Storz connection. South Kingstown Fire Department shall approve the final location of the fire department connection.

5.3 SYSTEM FEATURES

1. All new equipment is to be UL Listed and FM approved.
2. All new piping is as follows:
 - Schedule 10 Steel: 2 ½" and larger pipe.
 - Schedule 40 Steel: 1" to 2" pipe.
3. 1" inspector's test and auxiliary drain valves, and 2" main gang drain piping will be provided at each riser.
4. A new 6-inch backflow preventor with supervised isolation valves will be provided at the fire service entry point in the mechanical room.
5. Each floor control valve assembly will include a supervised control valve, pressure gauge, flow switch, check valve, pressure relief valve, combination test/drain valve, and piping.
6. Valve supervisory switches and waterflow switches will be connected to the building fire alarm system. Work will include interface and coordination with the fire alarm system contractor to complete this work.
7. A class I standpipe system will be provided for the building. The standpipe system will be equipped with hose valve connections at each floor landing within the stairwells.

5.4 DESIGN CRITERIA

The following design criteria will be provided:

1. All common corridors, common spaces, offices, classrooms, cafeteria, locker room and gymnasium spaces will be protected as Light Hazard occupancies. All Light Hazard occupancy areas will be provided with 0.10 gpm/ft² over the most remote 1,500 ft² and a 100-gpm hose allowance will be added in accordance with NFPA 13. Standard spray pendent and upright sprinklers will be located to cover a maximum area of 225 ft², while horizontal sidewall sprinklers will be located to cover a maximum area of 196 ft².
2. All laboratories, janitor closets, electrical/mechanical equipment rooms and kitchens will be protected as Ordinary Hazard Group 1 (OH-1) occupancies. All OH-1 occupancy areas will be provided with 0.15 gpm/ft²

over the most remote 1,500 ft² and a 250-gpm hose allowance in accordance with NFPA 13. Standard spray pendent and upright sprinklers will be located to cover a maximum area of 130 ft².

3. All storage rooms, stage/platforms, and construction technology classrooms will be protected as Ordinary Hazard Group (OH-2) occupancies. All OH-2 occupancy areas will be provided with 0.20 gpm/ft² over the most remote 1,500 ft² and a 250-gpm hose allowance will be added in accordance with NFPA 13. Standard spray pendent and upright sprinklers will be located to cover a maximum area of 130 ft².
4. The quick response reduction in accordance with NFPA 13 §11.2.3.2.3 shall be permitted where applicable.
5. The small room rule provisions of NFPA 13 §8.6.3.2.4 shall be permitted for light hazard spaces.

5.5 HYDRAULIC CALCULATIONS

Hydraulic calculations have not been provided for the schematic design submission.

5.6 INSPECTION, TESTING, AND MAINTENANCE

The sprinkler system contractor shall provide all initial system acceptance testing as required per NFPA 13 and NFPA 25 and provide a Material's and Test Certificate for Above Ground Pipe at the completion of the system commissioning. The sprinkler system contractor will be responsible for providing all required as-built documents, equipment O&M manuals, a new bound copy of NFPA 25, and training for personnel responsible for testing, inspection, and maintenance and/or the third-party company contracted with the Building Owner to provide testing, inspection, and maintenance. All future testing, inspection and maintenance, at the completion of the project, will be the responsibility of the Building Owner.

6.0 Fire Alarm System

6.1 FIRE ALARM CONTROL UNIT

The fire alarm control unit shall be addressable with capabilities to support an emergency voice and communications (EVACS) system. The fire alarm control unit will be provided with a remote microphone for paging throughout the building. Two (2) remote alarm annunciators will be provided at the main entrances. All fire alarm control equipment shall be provided with 60-hours of standby battery capacity with 15 minutes of alarm time. A key operated drill switch shall be provided at the fire alarm control panel.

6.2 FIRE ALARM SYSTEM WIRING

New fire alarm wiring is to be provided throughout the building. All fire alarm wiring will be Class A, with the exception of magnetic door hold circuits. All wiring shall follow the color code requirements outlined in RILSC 9.6.9.8. All wiring shall be installed in metal raceway of 3/4 inch minimum or approved MC Cable. MC Cable shall only be installed above accessible ceilings. Isolation modules shall be provided between floor levels, on either side of the control module used to actuate remote power supplies, and to limit the number of devices that can be affected by a single short circuit to 25.

6.3 EMERGENCY FORCES NOTIFICATION

Emergency forces notification will be provided directly to the South Kingstown Fire Department through a new eight zone (8) radio masterbox manufactured by AES Corporation. South Kingstown Fire Department has requested that the radio masterbox be programmed to transmit the following zones:

- + Zone 1: TBD
- + Zone 2: TBD
- + Zone 3: TBD
- + Zone 4: TBD
- + Zone 5: TBD
- + Zone 6: TBD
- + Zone 7: TBD
- + Zone 8: TBD

6.4 SPOT TYPE SMOKE DETECTORS

Smoke detectors will be located in elevator lobbies, common corridors, lobbies, stairways, above fire alarm control equipment, and other similar areas required by Code. When spot-type smoke detectors sense smoke, a signal will be sent to the FACU to start the evacuation sequence.

6.5 CARBON MONOXIDE DETECTORS

Carbon monoxide detectors will be located on the ceilings of rooms containing permanently installed fuel burning appliances. Additionally, carbon monoxide detectors will be provided in spaces served by the first supply air register from a permanently installed, fuel-burning HVAC system.

When a carbon monoxide detector senses an unsafe level of carbon monoxide, a temporal 4 tone will sound locally from the detector's sounder base. A supervisory signal will be transmitted to the FACU and the dedicated carbon monoxide strobe in the room of origin will flash.

6.6 SPOT TYPE HEAT DETECTORS

The building will be fully sprinklered in accordance with NFPA 13. As such, heat detection is not required except for in non-sprinklered areas where the applicable codes allow for the omission of sprinklers. The elevator hoist way shall be provided with a spot-type heat detector. The detector will transmit an alarm signal to the FACU upon sensing a fire to start the evacuation sequence. All heat detectors shall be combination fixed temperature and rate-of-rise heat detectors.

6.7 DUCT SMOKE DETECTORS

Duct smoke detectors will be provided for all air handling units with a capacity over 2,000 CFM and at each location where a fire/smoke damper is required in accordance with the provisions of the International Mechanical Code and NFPA 90. When a duct smoke detector senses smoke, the associated air handling unit shall shut down and the supervisory signal shall be annunciated at the fire alarm control unit.

6.8 MANUAL PULL STATIONS

Manual pull stations will be provided within 5-feet of all exits, with additional manual pull stations located throughout the building such that a manual pull station can be reached within 200 feet of travel on any floor. Manual pull station actuation shall transmit an alarm signal to the fire alarm control unit.

6.9 FIRE PROTECTION SYSTEM AND BUILDING INTERFACES

New addressable monitor modules shall be provided for all new sprinkler waterflow and tamper switches throughout the building.

Addressable control relay modules will be provided to shutdown air handling units over 2,000 CFM upon an alarm condition or duct detector actuation.

Addressable control relay modules will be provided for primary and alternate level elevator recall upon an alarm condition. An addressable control relay module will also be provided to control the firefighter's flashing hat function.

Addressable control relay modules will be provided to shutdown theatrical audio/visual equipment in the auditorium upon an alarm condition.

Addressable control relay modules will be provided for each audio system within the building to terminate sound upon general alarm.

Addressable control relay modules will be provided at each exit stairwell to override automatic light dimming controls upon general alarm.

An addressable control relay module will be provided for interface with the security system.

Addressable control modules will be provided to monitor the emergency generator.

The kitchen hood suppression systems will be supervised for discharge and trouble conditions.

6.10 MAGNETIC DOOR HOLDS

Magnetic door holds will be provided throughout the building as shown on the design drawings. These door holds will be powered under normal conditions with 24VDC power from a remote power supply. Upon an alarm condition, all door hold devices throughout the building shall be de-energized to release the doors. Doors shall also be automatically released upon AC power loss.

6.11 BI-DIRECTIONAL AMPLIFIER

A bi-directional amplifier (BDA) will be provided for the building. The BDA will be accompanied by an antenna on the roof. The BDA riser will consist of riser coaxial cables and be routed through a 2-hour rated enclosure. New addressable monitor modules shall be provided to supervise the BDA for antenna failure, trouble, power loss, charger trouble, and low battery. The fire alarm contractor will be responsible for conducting a signal strength test upon substantial completion of building construction. The fire alarm contractor should assume that a new BDA system will need to be installed to provide coverage throughout the entire building.

6.12 OCCUPANT NOTIFICATION

Occupant notification will be provided by an emergency voice and communications system (EVACS) utilizing speakers, strobes, and combination speaker-strobe appliances throughout the building. Notification appliances shall be provided in all public areas and common spaces including, but not limited to: conference rooms, bathrooms, classrooms, shared offices, auditoriums, gymnasiums, cafeterias, and common corridors. Speaker

paging zones will be provided in accordance with RISBC §907.5.2. The evacuation signal will be a temporal three (3) standard evacuation tone for two cycles followed by a pre-recorded evacuation message.

Remote power supplies for visual appliances shall be sized and field located by the fire alarm contractor and shall be actuated by the signaling line circuit. Digital audio amplifiers shall be sized and field located by the fire alarm contractor. Each primary amplifier will be supplemented with a backup amplifier.

6.13 INSPECTION, TESTING, AND MAINTENANCE

The fire alarm system contractor will provide all initial system acceptance-testing as required per NFPA 72. The fire alarm system contractor will be responsible for providing all required as-built documents, equipment O&M manuals, and information regarding the necessary system inspection, testing and maintenance instructions listed in NFPA 72. All future testing, inspection and maintenance, at the completion of the project, will be the responsibility of the Building Owner.

Attachment A: Water Supply Data

Memo

September 12, 2024

To: Tracey Donnelly (StudeoJAED)

From: Peter Steven Mottola (Jensen Hughes)

cc: Patrick Grant (Veolia Water)

Subject: South Kingstown High School Hydrant Flow Test Results

Introduction

Jensen Hughes performed a fire hydrant flow test in the vicinity of South Kingstown High School in South Kingstown, RI on September 12, 2024. The tests were performed to document the available water supply for design of the water-based fire suppression system for the new high school building.

Test Information

South Kingstown High School is located at 215 Columbia Street in South Kingstown, RI. The fire hydrants are supplied by the municipal water supply which is maintained and operated by Veolia Water. The hydrants utilized during the test are connected to a 12-inch main on Columbia Street.

The fire hydrant flow test was performed at 9:30am utilizing Hydrant 3-9 as the flow hydrant and Hydrant 3-7 as the gauge hydrant. The results of the hydrant flow test are documented below within Figure 1. The hydrant flow test map indicating the locations of the hydrants has been provided for reference in Figure 2.

TEST NO.	DATE/TIME		TEST RESULTS				
1	September 12, 2024 @ 9:30 AM						
Hydrant	Location	Elevation (ft)	Pressures (psi)			Orifice Size	Flow (gpm)
			Static	Residual	Pitot		
FLOW	3-9	48	--	--	17	2 ½"	643
GAUGE	3-7	36	80	77	--	--	--

Figure 1: Hydrant Flow Test Results

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Figure 2: Hydrant Flow Test Plan

Conclusion

Jensen Hughes appreciates this opportunity to support StudioJAED with this project. Please feel free to contact me at 401-252-0137 or pmottola@jensenhughes.com you have any questions.

Sincerely,

Jensen Hughes

Prepared by:

Peter Steven Mottola

Peter Steven Mottola
Fire Protection Consultant

Attachment B: Hydraulic Calculation Summary Report

Hydraulic calculations have not been provided for the schematic design submission.