

**TECHNICAL SPECIFICATIONS  
SECTION 211316  
DRY PIPE SPRINKLER SYSTEM  
PLAISTOW PUBLIC LIBRARY  
85 MAIN STREET  
PLAISTOW, NEW HAMPSHIRE**

**100%CD**

Prepared for:

Mr. Cab Vinton  
Director  
Plaistow Public Library  
85 Main Street  
Plaistow, NH 03865

November 5, 2017

## SECTION 211316 - DRY-PIPE SPRINKLER SYSTEMS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to this Section.

#### 1.2 SUMMARY

A. Scope of Work

1. The general scope of work includes removing and replacing the entire existing dry pipe sprinkler system in its entirety back to the main control valve between the existing fire pump (to remain) and the existing dry pipe valve (to be removed).
2. Work includes providing all fees, permitting, temporary construction, and all necessary equipment and labor to install a fully functional dry pipe sprinkler system with piping, sprinklers, hangers, and components, and installing a new Viking fire flex dry pipe valve cabinet with Nitrogen Generator for the existing pre-action system serving the existing network room.
3. During construction, the building will remain occupied. Therefore, work includes a phased project approach as follows:
  - a. Phase 1 – Remove the existing dry pipe riser (valve, trim, compressor, etc.) and install a new Viking Fire Flex dry pipe valve cabinet with N2 Generator in its place and reconnect the existing mains to the cabinet outlet to reactivate the system. This phase will also include other work within the fire pump room that may be necessary to install the cabinet with the correct working clearances (e.g. plumbing work to relocate domestic riser and components).
  - b. Phase 2 – Remove the existing feed main throughout the building as indicated on the project documents and install new feed main piping and fittings. All existing branchlines and cross mains will be connected to feed main in order to re-activate the system.
  - c. Phase 3 – In a building section by building section basis, existing cross mains, branchlines, sprinkler piping, and sprinklers will be removed and new system components will be installed and reconnected to the cross main for activation. Once the new section is activated the contractor will commence work on the next section through completion.
4. Work includes protecting all existing finishes, books, furniture, etc. in the respective work area.
5. Drawings supplied with this specification shall be used as a reference for the requirement and location of system components. Work includes visiting the site to observe the existing conditions, and for confirmation of the required quantities of devices and equipment and specific options for locations.
6. At the time of bid, all exceptions taken to this specification, variances from this specification, and all substitutions of equipment specified shall be listed in writing and forwarded to JSCE (Engineer) and the Plaistow Public Library (Owner). Any such exceptions, variances, or substitutions, which were not listed at the time of bid shall not be approved or considered.
7. Work includes all labor, materials, services, software, programming, tools, transportation, procurement of outside technical assistance including by factory trained technicians, and temporary construction necessary to fabricate, install, program, and test a fully operational and code compliant UL Listed system.
8. Work includes obtaining all fees and work necessary to obtain approval and all necessary permits.
9. Work includes all cutting, coring, patching, painting, and fire stopping activities.

B. Section Includes:

1. Pipes, fittings, and specialties.
2. Specialty valves.
3. Sprinkler specialty pipe fittings.

4. Sprinklers.
5. Alarm devices.
6. Manual control stations.
7. Control panels.
8. Pressure gages.

### 1.3 DEFINITIONS

- A. Standard-Pressure Sprinkler Piping: Dry-pipe sprinkler system piping designed to operate at working pressure of 175-psig maximum.

### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For dry-pipe sprinkler systems.
  1. Include plans, elevations, sections, and attachment details.
  2. Include diagrams for power, signal, and control wiring.

### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.
- C. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."
- D. Field quality-control reports.

### 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For dry-pipe sprinkler systems and specialties to include in emergency, operation, and maintenance manuals.

### 1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

## 1.8 QUALITY ASSURANCE

### A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing NICET Level III or IV services.

## 1.9 FIELD CONDITIONS

### A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:

1. Notify the Engineer and Owner no fewer than 5 days in advance of proposed interruption of sprinkler service.
2. Do not proceed with interruption of sprinkler service without Owner's written permission.

## PART 2 - PRODUCTS

### 2.1 SYSTEM DESCRIPTIONS

- #### A. Dry-Pipe Sprinkler System with Compressed Nitrogen: Automatic sprinklers are attached to piping containing compressed nitrogen produced from a nitrogen generator. Opening of sprinklers releases compressed nitrogen and permits water pressure to open dry-pipe valve. Water then flows into piping and discharges from opened sprinklers.

### 2.2 PERFORMANCE REQUIREMENTS

- #### A. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the Standard for the Installation of Automatic Sprinkler Systems (NFPA 13 – 2016 Edition).
- #### B. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.
1. Available fire-pump data is as indicated on the CD's:
- #### C. Sprinkler system design shall be approved by authorities having jurisdiction.
1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping and valves.
  2. Sprinkler Occupancy Hazard Classifications:
    - a. Building Service Areas: Ordinary Hazard, Group 1.
    - b. Electrical Equipment Rooms: Ordinary Hazard, Group 1.
    - c. General Storage Areas: Ordinary Hazard, Group.
    - d. Libraries except Stack Areas: Light Hazard.
    - e. Attic (non-storage): Light Hazard.
    - f. Library Stack Area (<8-Foot Shelving): Ordinary Hazard, Group 1.
    - g. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
    - h. Office and Public Areas: Light Hazard.

3. Minimum Density for Automatic-Sprinkler Piping Design:
  - a. Light-Hazard Occupancy: 0.10 gpm over 1,950-sq. ft. area.
  - b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1,950-sq. ft area.
  - c. Special Occupancy Hazard: Special Tyco attic sprinklers shall be designed for 0.10 gpm/s.f. over no more than 400 s.f.; but otherwise based on the manufacturer's product data sheets for the specific sprinkler indicated.
4. Maximum Protection Area per Sprinkler: According to UL listing.
5. Maximum Protection Area per Sprinkler:
  - a. Office Spaces: 225 sq. ft.
  - b. Storage Areas: 130 sq. ft.
  - c. Mechanical Equipment Rooms: 130 sq. ft..
  - d. Electrical Equipment Rooms: 130 sq. ft..
  - e. Attic: In accordance with manufacturer's specifications.

## 2.3 STEEL PIPE AND FITTINGS

- A. Standard-Weight, Black Steel Pipe: ASTM A 53/A 53M. Pipe ends may be factory or field formed to match joining method.
- B. Schedule 40,,: ASTM A 135/A 135M; ASTM A 795/A 795M, with thickness no less than Schedule 40. Pipe ends may be factory or field formed to match joining method.
- C. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.
- D. Steel Couplings: ASTM A 865/A 865M, threaded.
- E. Black-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.
- F. Malleable- or Ductile-Iron Unions: UL 860.
- G. Cast-Iron Flanges: ASME B16.1, Class 125.
- H. Grooved-Joint, Steel-Pipe Appurtenances:
  1. Manufacturer's: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Anvil International; Mueller Water Products, Inc.
    - b. Corcoran Piping Systems.
    - c. National Fittings, Inc.
    - d. Shurjoint Piping Products.
    - e. Tyco Fire Suppression & Building Products.
    - f. Victaulic Company.
  2. Pressure Rating: 175-psig minimum.
  3. Galvanized, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting, with dimensions matching steel pipe.
  4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

## 2.4 SPECIALTY VALVES

- A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
- B. Pressure Rating:
  - 1. Standard-Pressure Piping Specialty Valves: 175-psig (1200-kPa) minimum.
- C. Body Material: Cast or ductile iron.
- D. Size: Same as connected piping.
- E. End Connections: Flanged or grooved.
- F. Dry-Pipe Valves:
  - 1. Manufacturers: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Reliable Automatic Sprinkler Co., Inc.
    - b. Tyco Fire Suppression & Building Products.
    - c. Victaulic Company.
    - d. Viking Corporation.
  - 2. Standard: UL 260.
  - 3. Design: Differential-pressure type.
  - 4. Include UL 1486, quick-opening devices, trim sets for nitrogen supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
- G. Nitrogen Generator and N2-Pressure Maintenance Device:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Potter Electric Signal Co.
    - b. South-Tec Systems.
    - c. General Air Products.
    - d. Viking Corporation.
  - 2. Standard: UL 508A, 260.
  - 3. Type: Automatic device to maintain minimum air pressure in piping.
  - 4. Include shutoff valves to permit servicing without shutting down sprinkler piping, bypass valve for quick filling, pressure regulator or switch to maintain pressure, strainer, pressure ratings with 14- to 60-psig adjustable range, and 175-psig outlet pressure.
- H. Air Compressor:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Gast Manufacturing Inc.
    - b. General Air Products Inc.
    - c. Viking Corporation.
  - 2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
  - 3. Motor characteristics, such as NEMA designation, temperature rating, service factor, enclosure type, and efficiency, are specified in Section 210513 "Common Motor Requirements for Fire Suppression Equipment." If different characteristics are required, insert subparagraphs below to suit Project.
  - 4. Motor Horsepower: Fractional.
  - 5. Power: 120-V ac, 60 Hz, single phase.

## I. Automatic (Ball Drip) Drain Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - a. Reliable Automatic Sprinkler Co., Inc. (The).
  - b. Tyco Fire Suppression & Building Products.
  - c. Viking Corporation
2. Standard: UL 1726.
3. Pressure Rating: 175-psig.
4. Type: Automatic draining, ball check.
5. Size: NPS 3/4.
6. End Connections: Threaded.

## 2.5 SPRINKLER PIPING SPECIALTIES

## A. General Requirements for Dry-Pipe System Fittings: UL listed for dry-pipe service.

## B. Branch Outlet Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - a. Anvil International.
  - b. National Fittings, Inc.
  - c. Shurjoint Piping Products.
  - d. Tyco Fire Suppression & Building Products.
  - e. Victaulic Company.
2. Standard: UL 213.
3. Pressure Rating: 175-psig minimum
4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
5. Type: Mechanical-tee and -cross fittings.
6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
8. Branch Outlets: Grooved, plain-end pipe, or threaded.

## C. Flow Detection and Test Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - a. AGF Manufacturing Inc.
  - b. Reliable Automatic Sprinkler Co., Inc. (The).
  - c. Tyco Fire Suppression & Building Products.
  - d. Victaulic Company.
2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
3. Pressure Rating: 175-psig minimum.
4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

## D. Sprinkler Inspector's Test Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - a. AGF Manufacturing Inc.
  - b. Triple R Specialty.
  - c. Tyco Fire Suppression & Building Products.
  - d. Victaulic Company.
  - e. Viking Corporation.
2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
3. Pressure Rating: 175-psig minimum.
4. Body Material: Cast- or ductile-iron housing with sight glass.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

## 2.6 SPRINKLERS

## A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Reliable Automatic Sprinkler Co., Inc. (The).
2. Tyco Fire Suppression & Building Products.
3. Viking Corporation.

## B. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

## C. Pressure Rating for Automatic Sprinklers: 175-psig minimum.

## D. Automatic Sprinklers with Heat-Responsive Element:

1. Nonresidential Applications: [UL 199].
2. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6 or 8.0 and for "Ordinary" and "Intermediate" temperature classification rating as indicated on the drawings as required by application.

## E. Sprinkler Finishes: Chrome plated.

## F. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: Chrome-plated steel, two piece
2. Sidewall Mounting: Chrome-plated steel, one piece, flat.

## 2.7 ALARM DEVICES

## A. Alarm-device types shall match piping and equipment connections.

## B. Electrically Operated Alarm Bell:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - a. Fire-Lite Alarms, Inc.; a Honeywell company.
  - b. Notifier; a Honeywell company.
  - c. Potter Electric Signal Company, LLC.



2. Standard: UL 464.
3. Type: Vibrating, metal alarm bell.
4. Size: 6-inch minimum.
5. Finish: Red-enamel factory finish, suitable for outdoor use.
6. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Pressure Switches:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - a. Barksdale, Inc.
  - b. Detroit Switch, Inc.
  - c. Potter Electric Signal Company, LLC.
  - d. System Sensor; a Honeywell company.
  - e. Tyco Fire Suppression & Building Products.
  - f. United Electric Controls Co.
  - g. Viking Corporation.
2. Standard: UL 346.
3. Type: Electrically supervised water-flow switch with retard feature.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design Operation: Rising pressure signals water flow.

D. Valve Supervisory Switches:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - a. Fire-Lite Alarms, Inc.; a Honeywell company.
  - b. Kennedy Valve; a division of McWane, Inc.
  - c. Potter Electric Signal Company, LLC.
  - d. System Sensor; a Honeywell company.
2. Standard: UL 346.
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design: Signals that controlled valve is in other than fully open position.
6. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application

## 2.8 PRESSURE GAGES

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. AGF Manufacturing Inc.
2. AMETEK, Inc.; U.S. Gauge Division.
3. Ashcroft, Inc.
4. Brecco Distribution Corporation.
5. WIKA Instrument Corporation.

B. Standard: UL 393.

C. Dial Size: 3-1/2- to 4-1/2-inch diameter.

- D. Pressure Gage Range: 0- to 250-psig minimum.
- E. Label: Include "WATER" or "AIR/WATER" label on dial face.
- F. Air System Piping Gage: Include "AIR" or "AIR/WATER" label on dial face.

## PART 3 - EXECUTION

### 3.1 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.
  - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Engineer before deviating from approved working plans.
  - 2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.
- B. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.
- C. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- D. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- E. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- F. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13 at the end of the most remote branchline.
- G. Install sprinkler piping with drains for complete system drainage.
- H. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.
- I. Install automatic (ball drip) drain valves to drain piping between fire department connections and check valves. Drain to floor drain or to outside building.
- J. Connect compressed-nitrogen supply to dry-pipe sprinkler piping.
- K. Install alarm devices in piping systems.
- L. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements in NFPA 13. In seismic-rated areas, refer to Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."
- M. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they are not subject to freezing.
- N. Drain dry-pipe sprinkler piping.

- O. Pressurize and check dry-pipe sprinkler system piping and nitrogen generator, compressor, and storage tank.
- P. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."
- Q. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."
- R. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 210518 "Escutcheons for Fire-Suppression Piping."

### 3.2 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- B. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.
- G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- H. Steel-Piping, Rolled-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.
- I. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

### 3.3 VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.
- B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

D. Specialty Valves:

1. Install valves in vertical position for proper direction of flow, in main supply to system.
2. Install dry-pipe valves with trim sets for nitrogen supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
  - a. Install nitrogen generator, compressor, and nitrogen storage tank with air maintenance device.

3.4 SPRINKLER INSTALLATION

- A. Install pendent sprinklers in suspended ceilings in center of acoustical ceiling panels.
- B. Install pendent sprinklers on armovers extending from the top of the pipe to reduce scale in sprinkler drops.
- C. Install dry type pendent sprinklers in tees.
- D. Install special attic sprinklers in accordance with manufacturer's requirements and UL Listing.
- E. Install upright sprinklers with deflectors within 12-inches of deck above.
- F. Install intermediate temperature sprinklers in all areas that are not adequately insulated; i.e. throughout attic and in all dormers.

3.5 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

3.6 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
  1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
  2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
  3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
  4. Energize circuits to electrical equipment and devices.
  5. Start and run nitrogen generator and compressor.
  6. Coordinate with fire-alarm tests. Operate as required.
  7. Coordinate with fire-pump tests. Operate as required.
  8. Verify that equipment hose threads are same as local fire department equipment.
- B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.7 CLEANING

- A. Clean dirt and debris from sprinklers.
- B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

### 3.8 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain specialty valves.

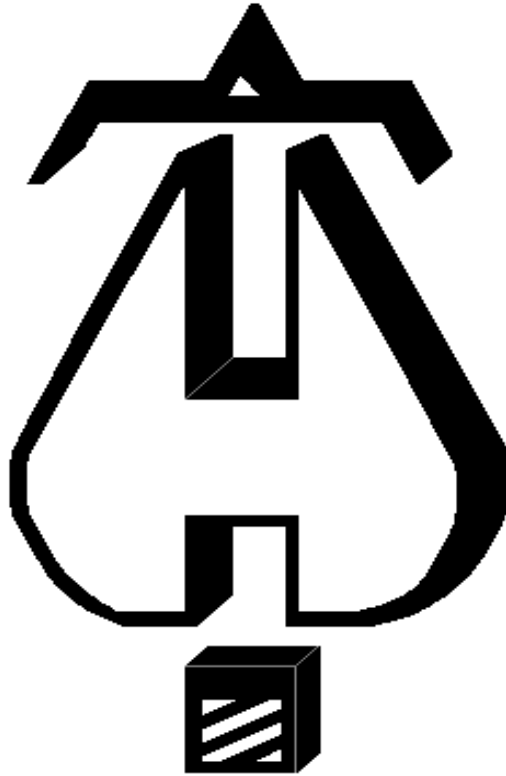
### 3.9 PIPING SCHEDULE

- A. Piping between Fire Department Connections and Check Valves: Galvanized, standard-weight steel pipe with grooved ends, grooved-end fittings, grooved-end-pipe couplings, and grooved joints.
- B. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.
- C. Standard-pressure, dry-pipe sprinkler system, NPS 2 and smaller shall be the following:
  - 1. Standard-weight (Schedule 40), black-steel pipe with threaded ends; black-iron threaded fittings; and threaded joints.
- D. Standard-pressure, dry-pipe sprinkler system, NPS 2-1/2 to NPS 4 shall be the following:
  - 1. Standard-weight (Schedule 40), black-steel pipe with roll-grooved ends; grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

### 3.10 SPRINKLER SCHEDULE

- A. Use sprinkler types in subparagraphs below for the following applications:
  - 1. Rooms without Ceilings: Upright sprinklers.
  - 2. Rooms with Suspended Ceilings: Pendent sprinklers.
  - 3. Spaces Subject to Freezing: Dry pendent sprinklers.
  - 4. Special Applications: Use Tyco Attic sprinklers as specified in the drawings for all attic applications.
- B. Provide sprinkler types in subparagraphs below with finishes indicated.
  - 1. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.
  - 2. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.
  - 3. Upright and Sidewall Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view.

END OF SECTION 211316



**... Fire Protection by Computer Design**

JS Consulting Engineers, LLC  
224 Main Street  
Suite 2C  
Salem, NH 03079  
603.327.8650

Job Name : 1706.168010 FS Upgrades Plaistow Lib  
Building : FS2.00  
Location : 85 Main Street, Plaistow, NH  
System : 1  
Contract : 1706.168010  
Data File : 1706.168010 FS Upgrades Plaistow Lib Area 1.WXF

---

**HYDRAULIC CALCULATIONS**  
**for**

**Project name:** Sprinkler System Replacement - Plaistow Public Library  
**Location:** 85 Main Street, Plaistow, NH  
**Drawing no:** FS2.00  
**Date:** 9/15/17

**Design**

**Remote area number:** 1  
**Remote area location:** First Floor South Stack Room  
**Occupancy classification:** Ordinary Hazard, Group 1  
**Density:** 0.15 - Gpm/SqFt  
**Area of application:** 1,950 - SqFt  
**Coverage per sprinkler:** 130 - SqFt  
**Type of sprinklers calculated:** SSP  
**No. of sprinklers calculated:** 18  
**In-rack demand:** NA - GPM  
**Hose streams:** 0 - GPM  
**Total water required (including hose streams):** 438.374 - GPM @ 53.3976 - Psi  
**Type of system:** DRY PIPE  
**Volume of dry or preaction system:** - Gal

**Water supply information**

**Date:** 10/5/16  
**Location:** Fire Pump Test  
**Source:** Vertical Turbine and Cistern

**Name of contractor:** JS Consulting Engineers, LLC  
**Address:** 224 Main Street / Suite 2C / Salem, NH 03079  
**Phone number:** 603.327.8650  
**Name of designer:**  
**Authority having jurisdiction:**  
**Notes: (Include peaking information or gridded systems here.)**

# Water Supply Curve C

JS Consulting Engineers, LLC  
 1706.168010 FS Upgrades Plaistow Lib

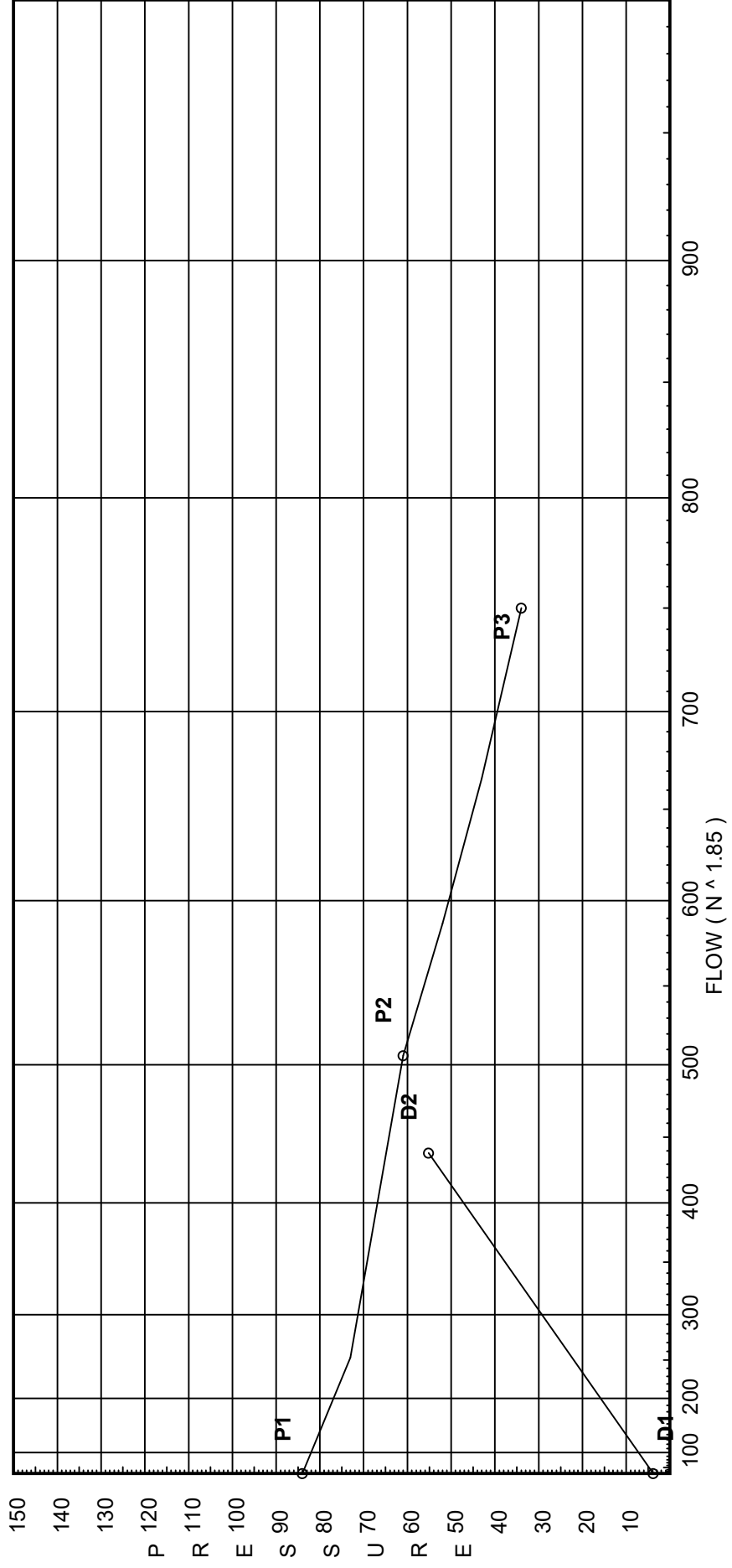
Page 2  
 Date

### Pump Data:

P1 - Pump Churn Pressure : 84  
 P2 - Pump Rated Pressure : 61  
 P3 - Pump Rated Flow : 506  
 P3 - Pump Pressure @ Max Flow : 34  
 P3 - Pump Max Flow : 750

### Demand:

D1 - Elevation : 3.863  
 D2 - System Flow : 438.374  
 D2 - System Pressure : 55.165  
 Hose ( Demand ) :  
 D3 - System Demand : 438.374  
 Safety Margin : 9.706





# Fittings Used Summary

JS Consulting Engineers, LLC  
 1706.168010 FS Upgrades Plaistow Lib

Page 3  
 Date

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
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
Dvk	Dry V/king F1								3		5		49								
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
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

## Unit 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.

# Pressure / Flow Summary - STANDARD

JS Consulting Engineers, LLC  
1706.168010 FS Upgrades Plaistow Lib

Page 4  
Date

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
1	8.92	5.6	12.13	na	19.5	0.15	130	7.0
2	10.75		11.81	na				
3	10.75		15.02	na				
4	10.75		21.18	na				
5	10.75		24.18	na				
6	9.25		26.23	na				
7	9.25		26.57	na				
8	9.25		26.79	na				
9	9.25		28.02	na				
10	9.25		28.29	na				
11	9.25		28.77	na				
12	9.25		29.45	na				
13	9.25		30.1	na				
14	9.25		30.56	na				
15	9.25		32.94	na				
BB	12.0		37.92	na				
AA	12.25		39.98	na				
16	9.25		44.99	na				
17	9.25		45.29	na				
18	9.25		47.1	na				
19	9.25		48.85	na				
20	1.5		53.71	na				
21	1.5		54.39	na				
PUMP	0.0		55.17	na				
22	8.92	5.6	12.56	na	19.84	0.15	130	7.0
23	10.75		12.25	na				
24	10.75		14.52	na				
25	10.75		20.69	na				
26	10.25	5.6	13.25	na	20.39	0.15	130	7.0
27	11.25		13.22	na				
28	8.92	5.6	14.05	na	20.99	0.15	130	7.0
29	10.75		13.81	na				
30	10.75		16.27	na				
31	10.75		23.06	na				
32	10.25	5.6	13.66	na	20.7	0.15	130	7.0
33	11.25		13.64	na				
34	10.25	5.6	14.6	na	21.4	0.15	130	7.0
35	11.25		14.61	na				
36	10.25	5.6	18.84	na	24.31	0.15	130	7.0
37	11.25		18.97	na				
38	10.25	5.6	19.0	na	24.41	0.15	130	7.0
39	11.25		19.13	na				
40	10.75		22.69	na				
41	10.75		24.08	na				
42	10.25	5.6	19.23	na	24.56	0.15	130	7.0
43	11.25		19.36	na				
44	10.25	5.6	20.02	na	25.06	0.15	130	7.0
45	11.25		20.18	na				
46	10.75		23.96	na				
47	10.25	5.6	20.67	na	25.46	0.15	130	7.0
48	11.25		20.85	na				
49	10.25	5.6	20.71	na	25.49	0.15	130	7.0
50	11.25		20.89	na				
51	8.92	5.6	21.94	na	26.23	0.15	130	7.0
52	9.75		22.19	na				
53	10.25	5.6	21.82	na	26.16	0.15	130	7.0
54	11.25		22.03	na				
55	8.92	5.6	24.08	na	27.48	0.15	130	7.0
56	9.75		24.39	na				
57	8.92	5.6	25.97	na	28.54	0.15	130	7.0
58	9.75		26.32	na				
59	10.25	5.6	26.1	na	28.61	0.15	130	7.0

# Flow Summary - Standard

JS Consulting Engineers, LLC  
1706.168010 FS Upgrades Plaistow Lib

Page 5  
Date

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
60	11.25		26.42	na				
61	10.75		28.75	na				
62	8.92	5.6	27.3	na	29.26	0.15	130	7.0
63	9.75		27.69	na				

The maximum velocity is 19.04 and it occurs in the pipe between nodes 9 and 10

# Final Calculations - Hazen-Williams - 2007

JS Consulting Engineers, LLC  
1706.168010 FS Upgrades Plaistow Lib

Page 6  
Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
1	19.50	1.049	E	2.0	1.830	12.125				
to		120.0		0.0	2.000	-0.793			K Factor = 5.60	
2	19.5	0.1243		0.0	3.830	0.476			Vel = 7.24	
2	0.0	1.049	4E	8.0	17.870	11.808				
to		120.0		0.0	8.000	0.0				
3	19.5	0.1242		0.0	25.870	3.213			Vel = 7.24	
3	20.70	1.049		0.0	13.000	15.021				
to		120.0		0.0	0.0	0.0				
4	40.2	0.4734		0.0	13.000	6.154			Vel = 14.92	
4	24.55	1.38	T	6.0	4.000	21.175				
to		120.0		0.0	6.000	0.0				
5	64.75	0.3008		0.0	10.000	3.008			Vel = 13.89	
5	49.90	2.469	3E	18.0	9.500	24.183				
to		120.0		0.0	18.000	0.650				
6	114.65	0.0509		0.0	27.500	1.400			Vel = 7.68	
6	26.23	2.469		0.0	4.500	26.233				
to		120.0		0.0	0.0	0.0				
7	140.88	0.0744		0.0	4.500	0.335			Vel = 9.44	
7	64.54	2.469		0.0	1.500	26.568				
to		120.0		0.0	0.0	0.0				
8	205.42	0.1500		0.0	1.500	0.225			Vel = 13.77	
8	27.48	2.469		0.0	6.500	26.793				
to		120.0		0.0	0.0	0.0				
9	232.9	0.1889		0.0	6.500	1.228			Vel = 15.61	
9	51.22	2.469		0.0	1.000	28.021				
to		120.0		0.0	0.0	0.0				
10	284.12	0.2730		0.0	1.000	0.273			Vel = 19.04	
10	0.0	3.068		0.0	5.000	28.294				
to		120.0		0.0	0.0	0.0				
11	284.12	0.0948		0.0	5.000	0.474			Vel = 12.33	
11	28.53	3.068		0.0	6.000	28.768				
to		120.0		0.0	0.0	0.0				
12	312.65	0.1132		0.0	6.000	0.679			Vel = 13.57	
12	67.85	3.068		0.0	4.000	29.447				
to		120.0		0.0	0.0	0.0				
13	380.5	0.1625		0.0	4.000	0.650			Vel = 16.51	
13	29.26	3.068		0.0	2.500	30.097				
to		120.0		0.0	0.0	0.0				
14	409.76	0.1868		0.0	2.500	0.467			Vel = 17.78	
14	28.61	3.068	E	7.0	4.260	30.564				
to		120.0		0.0	7.000	0.0				
15	438.37	0.2114		0.0	11.260	2.380			Vel = 19.02	
15	0.0	4.026	T	20.0	59.640	32.944				
to		120.0	3E	30.0	50.000	-1.191				
BB	438.37	0.0563		0.0	109.640	6.170			Vel = 11.05	
BB	0.0	4.026	3E	30.0	8.500	37.923				
to		120.0		0.0	30.000	-0.108				
AA	438.37	0.0563		0.0	38.500	2.167			Vel = 11.05	

# Final Calculations - Hazen-Williams

JS Consulting Engineers, LLC  
1706.168010 FS Upgrades Plaistow Lib

Page 7  
Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
AA to 16	0.0 438.37	4.026 120.0 0.0563	4E	40.0 0.0 0.0	25.960 40.000 65.960	39.982 1.299 3.712				Vel = 11.05
16 to 17	0.0 438.37	4.026 120.0 0.0563		0.0 0.0 0.0	5.350 0.0 5.350	44.993 0.0 0.301				Vel = 11.05
17 to 18	0.0 438.37	4.026 120.0 0.0563	2E	20.0 0.0 0.0	12.060 20.000 32.060	45.294 0.0 1.804				Vel = 11.05
18 to 19	0.0 438.37	4.026 120.0 0.0563	T E	20.0 10.0 0.0	1.110 30.000 31.110	47.098 0.0 1.751				Vel = 11.05
19 to 20	0.0 438.37	4.026 120.0 0.0563	Dvk G B	5.0 2.0 12.0	7.750 19.000 26.750	48.849 3.357 1.505				Vel = 11.05
20 to 21	0.0 438.37	4.026 120.0 0.0562	E	10.0 0.0 0.0	2.110 10.000 12.110	53.711 0.0 0.681				Vel = 11.05
21 to PUMP	0.0 438.37	4.026 120.0 0.0562		0.0 0.0 0.0	2.190 0.0 2.190	54.392 0.650 0.123				Vel = 11.05
	0.0 438.37					55.165				K Factor = 59.02
System Demand Pressure						55.165				
Safety Margin						9.706				
Continuation Pressure						64.871				
22 to 23	19.84 19.84	1.049 120.0 0.1285	E	2.0 0.0 0.0	1.830 2.000 3.830	12.555 -0.793 0.492				K Factor = 5.60 Vel = 7.37
23 to 24	0.0 19.84	1.049 120.0 0.1282	E	2.0 0.0 0.0	15.700 2.000 17.700	12.254 0.0 2.270				Vel = 7.37
24 to 25	20.39 40.23	1.049 120.0 0.4741		0.0 0.0 0.0	13.000 0.0 13.000	14.524 0.0 6.163				Vel = 14.93
25 to 7	24.31 64.54	1.38 120.0 0.2989	E T	3.0 6.0 0.0	8.500 9.000 17.500	20.687 0.650 5.231				Vel = 13.84
	0.0 64.54					26.568				K Factor = 12.52
26 to 27	20.39 20.39	1.049 120.0 0.1347	E	2.0 0.0 0.0	1.000 2.000 3.000	13.253 -0.433 0.404				K Factor = 5.60 Vel = 7.57
27 to 24	0.0 20.39	1.049 120.0 0.1349	E T	2.0 5.0 0.0	1.030 7.000 8.030	13.224 0.217 1.083				Vel = 7.57
	0.0 20.39					14.524				K Factor = 5.35

# Final Calculations - Hazen-Williams

JS Consulting Engineers, LLC  
1706.168010 FS Upgrades Plaistow Lib

Page 8  
Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
28	20.99	1.049	E	2.0	1.830	14.053			K Factor = 5.60	
to		120.0		0.0	2.000	-0.793				
29	20.99	0.1426		0.0	3.830	0.546			Vel = 7.79	
29	0.0	1.049	E	2.0	15.300	13.806				
to		120.0		0.0	2.000	0.0				
30	20.99	0.1423		0.0	17.300	2.462			Vel = 7.79	
30	21.40	1.049		0.0	13.000	16.268				
to		120.0		0.0	0.0	0.0				
31	42.39	0.5223		0.0	13.000	6.790			Vel = 15.74	
31	25.46	1.38	E	3.0	8.500	23.058				
to		120.0	T	6.0	9.000	0.650				
12	67.85	0.3279		0.0	17.500	5.739			Vel = 14.55	
	0.0									
	67.85					29.447			K Factor = 12.50	
32	20.70	1.049	E	2.0	1.000	13.660			K Factor = 5.60	
to		120.0		0.0	2.000	-0.433				
33	20.7	0.1383		0.0	3.000	0.415			Vel = 7.68	
33	0.0	1.049	E	2.0	1.380	13.642				
to		120.0	T	5.0	7.000	0.217				
3	20.7	0.1387		0.0	8.380	1.162			Vel = 7.68	
	0.0									
	20.70					15.021			K Factor = 5.34	
34	21.40	1.049	E	2.0	1.000	14.598			K Factor = 5.60	
to		120.0		0.0	2.000	-0.433				
35	21.4	0.1473		0.0	3.000	0.442			Vel = 7.94	
35	0.0	1.049	E	2.0	2.800	14.607				
to		120.0	T	5.0	7.000	0.217				
30	21.4	0.1473		0.0	9.800	1.444			Vel = 7.94	
	0.0									
	21.40					16.268			K Factor = 5.31	
36	24.31	1.049	E	2.0	1.000	18.844			K Factor = 5.60	
to		120.0		0.0	2.000	-0.433				
37	24.31	0.1867		0.0	3.000	0.560			Vel = 9.02	
37	0.0	1.049	E	2.0	1.030	18.971				
to		120.0	T	5.0	7.000	0.217				
25	24.31	0.1867		0.0	8.030	1.499			Vel = 9.02	
	0.0									
	24.31					20.687			K Factor = 5.34	
38	24.41	1.049	E	2.0	1.000	18.999			K Factor = 5.60	
to		120.0		0.0	2.000	-0.433				
39	24.41	0.1880		0.0	3.000	0.564			Vel = 9.06	
39	0.0	1.049	2E	4.0	13.750	19.130				
to		120.0		0.0	4.000	0.217				
40	24.41	0.1881		0.0	17.750	3.339			Vel = 9.06	
40	25.49	1.38	E	3.0	4.500	22.686				
to		120.0		0.0	3.000	0.0				
41	49.9	0.1857		0.0	7.500	1.393			Vel = 10.70	

# Final Calculations - Hazen-Williams

JS Consulting Engineers, LLC  
1706.168010 FS Upgrades Plaistow Lib

Page 9  
Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
41	0.0	2.469		0.0	9.500	24.079				
to		120.0		0.0	0.0	0.0				
5	49.9	0.0109		0.0	9.500	0.104		Vel =	3.34	
	0.0									
	49.90					24.183		K Factor =	10.15	
42	24.56	1.049	E	2.0	1.000	19.227		K Factor =	5.60	
to		120.0		0.0	2.000	-0.433				
43	24.56	0.1900		0.0	3.000	0.570		Vel =	9.12	
43	0.0	1.049	E	2.0	1.380	19.364				
to		120.0	T	5.0	7.000	0.217				
4	24.56	0.1902		0.0	8.380	1.594		Vel =	9.12	
	0.0									
	24.56					21.175		K Factor =	5.34	
44	25.06	1.049	E	2.0	1.000	20.024		K Factor =	5.60	
to		120.0		0.0	2.000	-0.433				
45	25.06	0.1973		0.0	3.000	0.592		Vel =	9.30	
45	0.0	1.049	2E	4.0	14.030	20.183				
to		120.0		0.0	4.000	0.217				
46	25.06	0.1974		0.0	18.030	3.560		Vel =	9.30	
46	26.16	1.38	E	3.0	8.500	23.960				
to		120.0	T	6.0	9.000	0.650				
9	51.22	0.1949		0.0	17.500	3.411		Vel =	10.99	
	0.0									
	51.22					28.021		K Factor =	9.68	
47	25.46	1.049	E	2.0	1.000	20.671		K Factor =	5.60	
to		120.0		0.0	2.000	-0.433				
48	25.46	0.2033		0.0	3.000	0.610		Vel =	9.45	
48	0.0	1.049	E	2.0	2.800	20.848				
to		120.0	T	5.0	7.000	0.217				
31	25.46	0.2034		0.0	9.800	1.993		Vel =	9.45	
	0.0									
	25.46					23.058		K Factor =	5.30	
49	25.49	1.049	E	2.0	1.000	20.712		K Factor =	5.60	
to		120.0		0.0	2.000	-0.433				
50	25.49	0.2037		0.0	3.000	0.611		Vel =	9.46	
50	0.0	1.049	E	2.0	0.750	20.890				
to		120.0	T	5.0	7.000	0.217				
40	25.49	0.2037		0.0	7.750	1.579		Vel =	9.46	
	0.0									
	25.49					22.686		K Factor =	5.35	
51	26.23	1.049	E	2.0	0.830	21.942		K Factor =	5.60	
to		120.0		0.0	2.000	-0.359				
52	26.23	0.2148		0.0	2.830	0.608		Vel =	9.74	
52	0.0	1.049	2E	4.0	8.800	22.191				
to		120.0	T	5.0	9.000	0.217				
6	26.23	0.2149		0.0	17.800	3.825		Vel =	9.74	
	0.0									
	26.23					26.233		K Factor =	5.12	

# Final Calculations - Hazen-Williams

JS Consulting Engineers, LLC  
1706.168010 FS Upgrades Plaistow Lib

Page 10  
Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
53 to 54	26.16	1.049 120.0	E	2.0 0.0	1.000 2.000	21.819 -0.433			K Factor = 5.60	
	26.16	0.2137		0.0	3.000	0.641			Vel = 9.71	
54 to 46	0.0	1.049 120.0	E T	2.0 5.0	1.030 7.000	22.027 0.217				
	26.16	0.2137		0.0	8.030	1.716			Vel = 9.71	
	0.0 26.16						23.960		K Factor = 5.34	
55 to 56	27.48	1.049 120.0	E	2.0 0.0	0.830 2.000	24.083 -0.359			K Factor = 5.60	
	27.48	0.2339		0.0	2.830	0.662			Vel = 10.20	
56 to 8	0.0	1.049 120.0	E T	2.0 5.0	2.350 7.000	24.386 0.217				
	27.48	0.2342		0.0	9.350	2.190			Vel = 10.20	
	0.0 27.48						26.793		K Factor = 5.31	
57 to 58	28.54	1.049 120.0	E	2.0 0.0	0.830 2.000	25.972 -0.359			K Factor = 5.60	
	28.54	0.2509		0.0	2.830	0.710			Vel = 10.59	
58 to 11	0.0	1.049 120.0	E T	2.0 5.0	1.870 7.000	26.323 0.217				
	28.54	0.2512		0.0	8.870	2.228			Vel = 10.59	
	0.0 28.54						28.768		K Factor = 5.32	
59 to 60	28.61	1.049 120.0	E	2.0 0.0	1.000 2.000	26.098 -0.433			K Factor = 5.60	
	28.61	0.2523		0.0	3.000	0.757			Vel = 10.62	
60 to 61	0.0	1.049 120.0	E T	2.0 5.0	1.380 7.000	26.422 0.217				
	28.61	0.2523		0.0	8.380	2.114			Vel = 10.62	
61 to 14	0.0	1.38 120.0	E T	3.0 6.0	8.500 9.000	28.753 0.650				
	28.61	0.0663		0.0	17.500	1.161			Vel = 6.14	
	0.0 28.61						30.564		K Factor = 5.18	
62 to 63	29.26	1.049 120.0	E	2.0 0.0	0.830 2.000	27.302 -0.359			K Factor = 5.60	
	29.26	0.2629		0.0	2.830	0.744			Vel = 10.86	
63 to 13	0.0	1.049 120.0	E T	2.0 5.0	1.340 7.000	27.687 0.217				
	29.26	0.2629		0.0	8.340	2.193			Vel = 10.86	
	0.0 29.26						30.097		K Factor = 5.33	





**... Fire Protection by Computer Design**

JS Consulting Engineers, LLC  
224 Main Street  
Suite 2C  
Salem, NH 03079  
603.327.8650

Job Name : 1706.168010 FS Upgrades Plaistow Lib ATTIC  
Building : FS2.01  
Location : 85 Main Street, Plaistow, NH  
System : 2  
Contract : 1706.168010  
Data File : 1706.168010 FS Upgrades Plaistow Lib ATTIC Area 2.WXF

---

**HYDRAULIC CALCULATIONS**  
**for**

**Project name:** Sprinkler System Replacement - Plaistow Public Library

**Location:** 85 Main Street, Plaistow, NH

**Drawing no:** FS2.01

**Date:** 9/15/17

**Design**

**Remote area number:** 2

**Remote area location:** ATTIC BB2 RIDGE SPRINKLERS

**Occupancy classification:** LIGHT HAZARD

**Density:** 0.11 - Gpm/SqFt

**Area of application:** 7 SPRINKLERS - SqFt

**Coverage per sprinkler:** 380 - SqFt

**Type of sprinklers calculated:** TYCO BB2

**No. of sprinklers calculated:** 7

**In-rack demand:** NA - GPM

**Hose streams:** 0 - GPM

**Total water required (including hose streams):** 278 - GPM @ 72 - Psi

**Type of system:** DRY PIPE

**Volume of dry or preaction system:** - Gal

**Water supply information**

**Date:** 10/5/16

**Location:** Fire Pump Test

**Source:** Vertical Turbine and Cistern

**Name of contractor:** JS Consulting Engineers, LLC

**Address:** 224 Main Street / Suite 2C / Salem, NH 03079

**Phone number:** 603.327.8650

**Name of designer:**

**Authority having jurisdiction:**

**Notes: (Include peaking information or gridded systems here.)**

# Water Supply Curve C

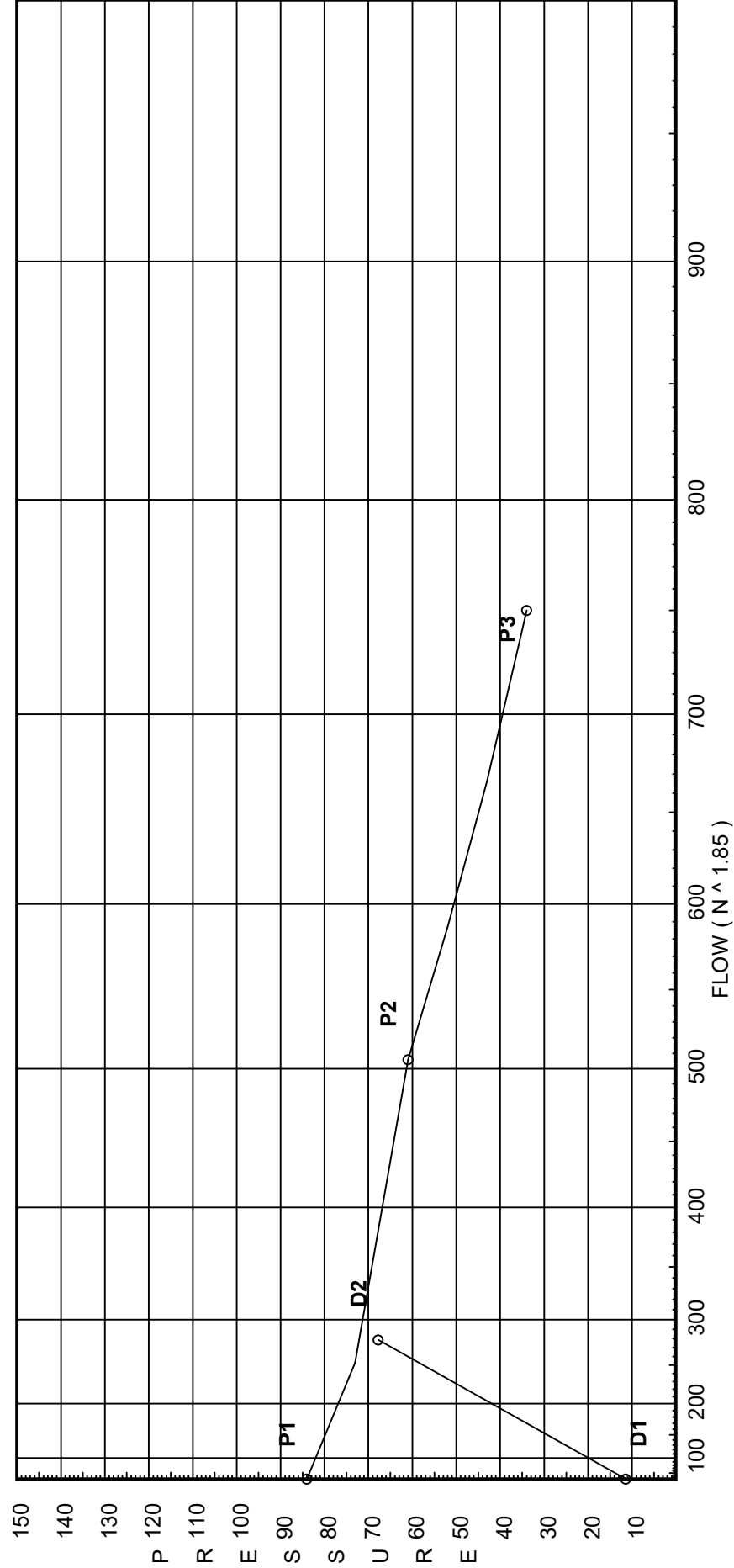
JS Consulting Engineers, LLC  
 1706.168010 FS Upgrades Plaistow Lib ATTIC

### Pump Data:

P1 - Pump Churn Pressure : 84  
 P2 - Pump Rated Pressure : 61  
 P3 - Pump Rated Flow : 506  
 P3 - Pump Pressure @ Max Flow : 34  
 P3 - Pump Max Flow : 750

### Demand:

D1 - Elevation : 11.443  
 D2 - System Flow : 278.803  
 D2 - System Pressure : 67.739  
 Hose ( Demand ) :  
 D3 - System Demand : 278.803  
 Safety Margin : 4.354



# Fittings Used Summary

JS Consulting Engineers, LLC  
 1706.168010 FS Upgrades Plaistow Lib ATTIC

Page 3  
 Date

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
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
Dvk	Dry V/king F1								3		5		49								
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
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

## Unit 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.

# Pressure / Flow Summary - STANDARD

JS Consulting Engineers, LLC  
1706.168010 FS Upgrades Plaistow Lib ATTIC

Page 4  
Date

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
64	26.42	8	22.6	na	38.03	0.1	380	22.6
65	26.42	8	22.69	na	38.11	0.1	380	22.6
66	26.42	8	23.03	na	38.4	0.1	380	22.6
67	26.42	8	23.76	na	38.99	0.1	380	22.6
68	26.42	8	25.01	na	40.0	0.1	380	22.6
69	26.42		29.33	na				
70	12.0		39.37	na				
CC	12.25		46.25	na				
10	9.25		53.22	na				
11	9.25		53.67	na				
12	9.25		54.22	na				
13	9.25		54.59	na				
14	9.25		54.82	na				
15	9.25		55.85	na				
71	9.25		55.93	na				
BB	12.0		57.33	na				
AA	12.25		58.16	na				
16	9.25		61.06	na				
17	9.25		61.19	na				
72	9.25		61.92	na				
18	9.25		61.97	na				
19	9.25		62.73	na				
20	1.5		66.74	na				
21	1.5		67.04	na				
PUMP	0.0		67.74	na				
73	26.42	8	28.34	na	42.59	0.1	380	22.6
74	26.42	8	28.46	na	42.68	0.1	380	22.6

The maximum velocity is 18.68 and it occurs in the pipe between nodes 69 and 70

# Final Calculations - Hazen-Williams - 2007

JS Consulting Engineers, LLC  
1706.168010 FS Upgrades Plaistow Lib ATTIC

Page 5  
Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftnng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
64	38.03	2.067		0.0	6.000	22.600				
to		120.0		0.0	0.0	0.0			K Factor = 8.00	
65	38.03	0.0157		0.0	6.000	0.094			Vel = 3.64	
65	38.11	2.067		0.0	6.000	22.694			K Factor = 8.00	
to		120.0		0.0	0.0	0.0				
66	76.14	0.0568		0.0	6.000	0.341			Vel = 7.28	
66	38.40	2.067		0.0	6.000	23.035			K Factor = 8.00	
to		120.0		0.0	0.0	0.0				
67	114.54	0.1207		0.0	6.000	0.724			Vel = 10.95	
67	38.99	2.067		0.0	6.000	23.759			K Factor = 8.00	
to		120.0		0.0	0.0	0.0				
68	153.53	0.2078		0.0	6.000	1.247			Vel = 14.68	
68	40.01	2.067	T	10.0	3.560	25.006			K Factor = 8.00	
to		120.0		0.0	10.000	0.0				
69	193.54	0.3187		0.0	13.560	4.322			Vel = 18.50	
69	85.26	2.469		0.0	14.420	29.328				
to		120.0		0.0	0.0	6.245				
70	278.8	0.2636		0.0	14.420	3.801			Vel = 18.68	
70	0.0	2.469	2E	12.0	14.500	39.374				
to		120.0		0.0	12.000	-0.108				
CC	278.8	0.2635		0.0	26.500	6.984			Vel = 18.68	
CC	0.0	2.469	E	6.0	3.500	46.250				
to		120.0	T	12.0	18.000	1.299				
10	278.8	0.2636		0.0	21.500	5.667			Vel = 18.68	
10	0.0	3.068		0.0	5.000	53.216				
to		120.0		0.0	0.0	0.0				
11	278.8	0.0914		0.0	5.000	0.457			Vel = 12.10	
11	0.0	3.068		0.0	6.000	53.673				
to		120.0		0.0	0.0	0.0				
12	278.8	0.0915		0.0	6.000	0.549			Vel = 12.10	
12	0.0	3.068		0.0	4.000	54.222				
to		120.0		0.0	0.0	0.0				
13	278.8	0.0915		0.0	4.000	0.366			Vel = 12.10	
13	0.0	3.068		0.0	2.500	54.588				
to		120.0		0.0	0.0	0.0				
14	278.8	0.0916		0.0	2.500	0.229			Vel = 12.10	
14	0.0	3.068	E	7.0	4.260	54.817				
to		120.0		0.0	7.000	0.0				
15	278.8	0.0915		0.0	11.260	1.030			Vel = 12.10	
15	0.0	4.026		0.0	3.500	55.847				
to		120.0		0.0	0.0	0.0				
71	278.8	0.0246		0.0	3.500	0.086			Vel = 7.03	
71	0.0	4.026	T	20.0	56.140	55.933				
to		120.0	3E	30.0	50.000	-1.191				
BB	278.8	0.0244		0.0	106.140	2.586			Vel = 7.03	
BB	0.0	4.026	3E	30.0	8.500	57.328				
to		120.0		0.0	30.000	-0.108				
AA	278.8	0.0243		0.0	38.500	0.937			Vel = 7.03	

# Final Calculations - Hazen-Williams

JS Consulting Engineers, LLC  
 1706.168010 FS Upgrades Plaistow Lib ATTIC

Page 6  
 Date

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv. Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	*****	Notes	*****
AA to 16	0.0 278.8	4.026 120.0 0.0244	4E 40.0 0.0 0.0	25.960 40.000 65.960	58.157 1.299 1.607		Vel = 7.03		
16 to 17	0.0 278.8	4.026 120.0 0.0245	0.0 0.0 0.0	5.350 0.0 5.350	61.063 0.0 0.131		Vel = 7.03		
17 to 72	0.0 278.8	4.026 120.0 0.0243	2E 20.0 0.0 0.0	9.700 20.000 29.700	61.194 0.0 0.723		Vel = 7.03		
72 to 18	0.0 278.8	4.026 120.0 0.0246	0.0 0.0 0.0	2.360 0.0 2.360	61.917 0.0 0.058		Vel = 7.03		
18 to 19	0.0 278.8	4.026 120.0 0.0244	T 20.0 E 10.0 0.0	1.110 30.000 31.110	61.975 0.0 0.758		Vel = 7.03		
19 to 20	0.0 278.8	4.026 120.0 0.0243	Dvk 5.0 G 2.0 B 12.0	7.750 19.000 26.750	62.733 3.357 0.651		Vel = 7.03		
20 to 21	0.0 278.8	4.026 120.0 0.0244	E 10.0 0.0 0.0	2.110 10.000 12.110	66.741 0.0 0.295		Vel = 7.03		
21 to PUMP	0.0 278.8	4.026 120.0 0.0242	0.0 0.0 0.0	2.190 0.0 2.190	67.036 0.650 0.053		Vel = 7.03		
	0.0 278.80				67.739		K Factor = 33.87		
					67.739				
					4.354				
					72.093				
73 to 74	42.59 42.59	2.067 120.0 0.0195	0.0 0.0 0.0	6.000 0.0 6.000	28.341 0.0 0.117		K Factor = 8.00 Vel = 4.07		
74 to 69	42.68 85.27	2.067 120.0 0.0699	T 10.0 0.0 0.0	2.440 10.000 12.440	28.458 0.0 0.870		K Factor = 8.00 Vel = 8.15		
	0.0 85.27				29.328		K Factor = 15.75		