

COLORADO SPRINGS FIRE DEPARTMENT, DIVISION OF THE FIRE MARSHAL

MULTIPURPOSE FIRE SPRINKLER SYSTEMS

General Requirements per Chapter 9 of the Locally Amended 2015
International Fire Code and the Applicable NFPA Codes.



Fire Construction Services
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PURPOSE

This guidance document has been developed in an effort to provide the highest level of service to the customers of the CSFD. The major goal of is to ensure the design of multipurpose fire sprinkler systems meet the minimum requirements of the adopted codes, standards, and ordinances. To meet this goal, the submitted plans and supporting documentation must contain the information needed to conduct a thorough review.

SCOPE

This guidance document outlines the minimum requirements set forth in the International Fire Code, local amendments, and departmental policies and procedures as they relate to the installation of multipurpose fire sprinkler systems. This guidance document is not intended to provide an all-inclusive listing of submittal and inspection requirements, as it would be virtually impossible to cover all situations. This guidance document covers requirements set forth in the latest edition of NFPA 13D and the adopted codes. Also included is information covering items required to be included on the working drawings and supporting documents.

Multipurpose fire sprinkler systems serve both domestic and fire sprinklers from one common piping system throughout the dwelling unit. Note that passive purge or flow-through systems do not qualify as a true multipurpose system and are beyond the scope of this document.

DEFINITIONS

CSFD	Colorado Springs Fire Department
CSU	Colorado Springs Utilities
Ft ²	Square feet
GPM	Gallons per Minute
IFC	International Fire Code
K-factor	Sprinkler head discharge coefficient
NFPA	National Fire Protection Association
NICET	National Institute for Certification in Engineering Technologies
PSI	Pounds force per square inch
RBD	Regional Building Department
SIN	Sprinkler Identification Number
CD	Compact Disc
RME	Responsible Managing Employee

GUIDELINES

I. INTRODUCTION.

A. APPLICABLE CODES AND STANDARDS.

1. 2015 International Fire Code and local Amendments.
2. 2015 International Plumbing Code and local Amendments.
3. 2015 International Residential Code and local Amendments.
4. 2019 Edition of NFPA 13D Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes.
5. 2019 Edition of NFPA 72 National Fire Alarm Code.

6. Colorado Springs City Ordinances.
7. CSFD Administrative Rulings/Interpretations.

B. ADMINISTRATIVE REQUIREMENTS.

1. **Approved Contractors.** All multipurpose contractors must obtain a Colorado Springs Fire Suppression Contractor M (FSC-M) License in order to install, add to, alter, service, repair, test, maintain and inspect multipurpose fire sprinkler systems, in accordance with Pikes Peak Regional Building Code, Section 207. Please reference our Contractor Licensing Application Guide for details or contact Regional Building Department, Contractor Licensing at 719-327-2887 for information on becoming licensed. The manufacturers are not required to be licensed.
2. **Approved Installers.** A Colorado Springs licensed Installer-Limited (FSI-L) shall be on-site for all installations, additions, alterations, repair and inspections of multipurpose sprinkler systems, in accordance with Pikes Peak Regional Building Code, Section 207. Please contact Regional Building Department, Contractor Licensing at 719-327-2887 for information on becoming licensed.
3. **Code/Standard Editions.** Multipurpose fire sprinkler systems shall meet the criteria of the adopted IFC and Plumbing Code, as amended, adopted ordinances, CSFD administrative rulings, and all applicable requirements of the most recent edition of the NFPA standards. NFPA standards are effective on January 1st of the year following the effective date printed in the standard.
4. **Permits/Inspections.** Required plan submittal with approvals and permits must be secured through CSFD and Pikes Peak Regional Building Department (PPRBD) prior to the start of any work. Permitted work must be inspected by CSFD.
5. **Alternative Methods.** If special building conditions and/or restrictions exist that may prohibit any of the requirements set forth in this guidance document from being met, approval from CSFD for an alternative means and methods approach is required. The alternative means and methods must be approved before installation of the system begins.
6. **Non-Required Systems.** All non-required fire sprinkler systems shall meet the requirements of adopted codes and standards. Additionally, they shall be submitted for review and approval to CSFD.
7. **Revisions.** All revisions shall be clouded and identified with a sequential numbering or lettering system, such as Revision A, B, etc. or Revision 1, 2, etc. Revisions are date sensitive, thus each revised sheet must bear the date of the revision.
8. **As-Built Plans.** All deviations from approved plans shall be documented and submitted to CSFD to archive. Reviews will not be conducted on as-built plans, unless specifically required by the fire inspector, as these field changes are often verified as compliant by the fire inspector. All As-built plans shall be conspicuously marked as such.

II. SUBMITTAL INFORMATION.

This section of the guidance document provides information regarding documentation and shop drawings that shall be provided at the time of plan submittal. This documentation is required to assure the plan submittal package contains the necessary information for a complete plan review.

A. CONSTRUCTION DOCUMENTS.

Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that it will conform to the provisions of the IFC, and relevant laws, ordinances, rules and regulations as determined by the CSFD.

Plans shall be legible, dark-lined and reproducible with conventional copying equipment. Please do not use colored highlighting as these are frequently not reproducible. Also do not use colored or gray background shading as these interfere with scanning.

Be sure to include information regarding beams (width/depth), whether structural or decorative, ceiling fans, light fixtures, ceiling heights especially when there are ceiling pockets or coffered ceilings.

B. MINIMUM REQUIREMENTS FOR SUBMITTAL.

1. **Drawing Size.** Drawings shall be submitted on sheets no less than 24x36 inches and shall be drawn to 1/8"

or ¼" scale. Other scales may be accepted on an as-needed basis, please contact the CSFD Construction Services if you have questions regarding the use of different scales. Plans shall contain the information and/or details indicated in the checklist in the appendix.

2. **Plan Review Number.** Submittals associated with a construction project shall be provided with the CSFD Plan Review Number. This number is an eight digit numeric code located on the back of the construction plans. Fire sprinkler system work only projects shall be indicated as such on the submittal so that it can be assigned a plan review number.
3. **Number of Drawing Sets.** A minimum of two (2) sets of drawings are required to be submitted to CSFD. A maximum of three (3) original sets may be stamped with our approval. All plan sheets shall be signed/sealed by a NICET level III/IV or a Colorado registered Professional Engineer, employed by the manufacturer of the system being used. The RME of the licensed fire sprinkler contractor shall also sign the plans.
4. **Cut Sheets/Specifications.** A minimum of one (1) set of manufacturer's product information (cut sheets) shall be provided. This is to include information on all devices that are part of or being connected to, the multipurpose fire sprinkler system. It is not necessary to include cut sheets for plumbing fixtures such as sinks, toilets, etc. unless specifically requested by CSFD. When cut sheets show multiple models/types of devices, the specific item(s) being installed shall be highlighted. For example, in using extended coverage heads, the spacing utilized in the design and calculations shall be highlighted on the cut sheets as well as indicated on the drawings.

A table of contents shall be provided and the specifications package shall be tabbed with the following sections: water supply, sprinklers, piping and fittings, valves, hangers, appurtenances and other system components, Operating instructions for the entire system, and manufacturer approved testing instructions.

Cut sheets shall be rolled inside the plans to prevent them from becoming separated. Stamped cut sheets will be returned to the contractor and must remain on the job site with the approved plans. The cover of the cut sheets shall be signed/sealed by a NICET level III/IV or a Colorado registered Professional Engineer, employed by the manufacturer of the system being used. The RME of the licensed fire sprinkler contractor shall also sign the cover page.

CSFD accepts cut sheets on CD. The CD must have the individual cut sheets for the materials specific to the job – we will not accept manufacturer's CD's! If this option is chosen, CSFD will stamp, date and initial the CD – it is then the contractor's responsibility to provide the means of reviewing that disk upon the fire inspector's request.

5. **Hydraulic Calculations.** A minimum of two (2) sets of hydraulic calculations are required to be submitted to CSFD and shall include the items found in the checklist provided in appendix. One set will be retained by CSFD for our records. The cover page of all hydraulic calculations shall be signed/sealed by a NICET level III/IV or a Colorado registered Professional Engineer, employed by the manufacturer of the system being used. The RME of the licensed fire sprinkler contractor shall also sign the cover page.

III. GENERAL INFORMATION AND REQUIREMENTS.

- A. **Monitoring.** Local water flow alarms shall be installed on all sprinkler systems in homes not equipped with smoke alarms or smoke detectors in accordance with NFPA 72. It is not the intent of NFPA 13D to require supervising station monitoring for these systems.
- B. **Water Supply Information.** Theoretical water supply information shall be obtained from Colorado Springs Utilities. CSFD will accept actual flow tests for fire sprinkler plan submittal and hydraulic calculations on a case by case basis. Delegated reviews for outside fire protection districts shall contact the local water district to obtain water supply information. The information on this report shall be dated within one (1) year. A copy of the water supply information shall be provided with your submittal package.

On the water supply graph, a curve showing the PRV controlled water supply shall be provided. This is the information that must be used in the design of the multipurpose fire sprinkler system.

The water supply graph shall indicate a second curve showing 10% reduction in the water supply. This curve shall be separate and distinguishable and have a slope parallel to the 100% supply curve. You must provide

the 100% theoretical water supply information, with the reduced water supply information indicated on the graph sheet, or on the plans. Do not supply us with only the reduced information.

Example of correct 10% water supply reduction:

100% water supply: static: 145 psi; residual: 20 psi; Flow: 3400 gpm

90% water supply: static: $145 \times .9 = 130.5$ psi; residual: $20 - (145 - 130.5) = 5.5$ psi; Flow: 3400 gpm

The required sprinkler system flow and pressure shall fall on or under the 90% PRV controlled curve

C. ADDITIONAL REQUIREMENTS.

1. **Plastic Pipe and Spray Foam Insulation.** Compatibility shall be verified and proof of application in accordance with manufacturer requirements shall be provided. In general, it is best to avoid using spray foam insulation with plastic piping due to the exothermic reaction of the spray foam during the curing process. The heat generated by the exothermic reaction can result in the strength of the pipe walls being compromised.
2. **Freezing Conditions.** Here in Colorado, we experience sub-zero temperatures and the fire sprinkler system may freeze if not properly protected.

Water pipes shall not be installed outside of a building, in attics or crawlspaces, concealed in outside walls, or in any other place subjected to freezing temperature unless adequate provision is made to protect such pipes from freezing by insulation or heat or both. No insulation may be placed between the sprinkler piping and the heated/conditioned space.

3. **Reduce Pressure Backflow.** Multipurpose fire sprinkler systems shall be provided with a reduce pressure backflow preventer per Colorado Springs Utilities requirements.
4. **Warning Sign.** A warning sign, with minimum ¼ inch letter shall be affixed to the main shutoff valve and shall state the following:

WARNING: *The water system for this home supplies fire sprinklers that required certain flows and pressure to fight a fire. Devices that restrict the flow or decrease the pressure or automatically shut off the water to the fire sprinkler system such as water softeners, filtration systems and automatic shutoff valves, shall not be added to this system without a review of the fire sprinkler system by a fire protection specialist. Do not remove this sign.*

IV. INSTALLATION.

A. CONSTRUCTION PERMITS

1. A construction permit is required for installation of or modification to a multipurpose sprinkler system. Any modification to an existing multipurpose fire sprinkler system requires a permit.
2. Maintenance is defined as the work necessary to keep equipment operable or to make repairs. An example of maintenance work would be exercising valves, lubing stems or cleaning strainers. Replacing existing sprinklers due to age, paint or damage would be considered repair work and not subject to permit requirements.
3. The installation of the multipurpose sprinkler system is not to commence, including any pre-piping, until the working plans have been reviewed and approved by CSFD a permit secured on site, per IFC 105.1.2. To begin work prior to plan approval, contact the CSFD for further information. Plumbing to and installation of domestic piping and/or fixtures is not regulated by CSFD. Please contact Pikes Peak Regional Building Department if you wish to start installation of the domestic piping prior to CSFD approval.
4. Permits for multipurpose fire sprinkler systems expire one year after date of issue. A 30-day grace period is allowed to renew the permit. After the grace period expires, if inspections have been conducted in the past 13 months, new plans and permit is not required to be submitted for issuance of a new permit. If the grace period has expired and no inspections have occurred in the past 13 months, new plans shall be submitted prior to issuance of a new permit.

V. INSPECTIONS AND TESTING.

It shall be the duty of the person doing the work authorized by a permit to notify the CSFD and RBD that the work is

ready for inspection. It shall also be the responsibility of the person requesting the inspections to provide access to and means for proper inspection of the work.

Be advised that approval as the result of an inspection shall not be construed to be an approval of a violation of the provision of the adopted fire code, standards or of other ordinances of the City of Colorado Springs. Inspections presuming to give authority to violate or cancel provision of this code or of other ordinances of the jurisdiction shall not be valid (IFC 106.4).

Systems shall undergo an acceptance test witnessed by CSFD. The building shall not be occupied or stocked with furniture until the sprinkler system has been inspected and approved by CSFD.

A. ABOVEGROUND PIPING.

1. **Visual Inspection.** Sprinkler locations will be visually inspected and approved to ensure installation is per approved plans and any deviations do not exceed listing limitations of sprinklers. Piping and supports shall be in accordance with the locally adopted plumbing code and will be verified by the plumbing inspector.
2. **Hydrostatic Test.** The systems shall be hydrostatically tested at normal system operating pressure, in accordance with the locally adopted plumbing code. The hydrostatic test may be conducted using sprinklers or plugs installed in the fittings. If plugs are used, additional testing is not required. Hydrostatic testing will be verified by the plumbing inspector.
3. **System Operational Tests.**

There are two options available for the operational acceptance test:

Bucket Test. Water will be flowed from the remote sprinklers into calibrated buckets for a minimum one minute. Pressures and flow will be recorded during this time. Buckets shall be calibrated in 1-gallon increments. The amount of water in the bucket is compared to the demand of the system to result in a pass/fail score.

Main Drain and Underground flush. In lieu of the traditional bucket test, a main drain with an underground flush and hydrostatic test at system pressure, as referenced in CSFD Administrative Ruling 2017-5, is also accepted. This flush and hydrostatic test must be witnessed by CSFD.

B. UNDERGROUND PIPING.

CSFD does not perform visual inspections of the underground service lines; CSU Service Line Inspections will inspect the service line and approve the burial.

C. COMPLETION DOCUMENTS.

1. An owner's manual and installation instructions covering the multipurpose sprinkler system equipment. This information is to include instructions on inspection, testing and maintenance of the system.
2. A copy of the completed *Fire Sprinkler System Installer's Certification*.
3. Permanent records such as hydraulic nameplate and general information in shall be provided.

REFERENCES AND LINKS

1. Colorado Division of Fire Prevention and Control site. <http://dfpc.state.co.us/>
2. CSU Water & Wastewater specifications. <http://www.csu.org/>
3. Administrative Rulings and IFC Amendments can be found on the CSFD web site at <https://coloradosprings.gov/fire-department/page/fire-code-amendments-and-administrative-rulings?mlid=9796>

APPENDIXES

- A. Working Drawing Submittal Checklist
- B. Hydraulic Calculations Submittal Checklist

Appendix A: Plan Requirements per NFPA 13D and CSFD.

Working Drawings

Title Block shall contain the following:

- Name of owner and occupant
- Location including full street address as assigned by RBD Enumerations
- Name, address, phone, FAX number and email address of installing contractor and designer
- Signature/seal by a person holding a NICET level III or IV certification in sprinkler systems or State of Colorado Professional Engineering license, employed by the manufacturer of the system used. Signature of sprinkler contractor RME.
- CSFD Plan Review number
- Point of Compass on every page
- A scale including graphic representation
- Detailed scope of work

Information required on Drawings:

Building Information:

- Construction type
- Full height scaled elevations and cross sections of the building. Be sure to include structural information and ceiling construction for clarity. Section cut lines shall be indicated
- Location of partitions, fire walls and /or area separation walls and rating classifications
- Location of full-height walls
- Location of concealed spaces, closets, attics and bathroom including dimensions
- Location areas where sprinklers have been intentionally omitted. Must also note with a code reference why sprinklers were omitted from these areas
- A copy of the RBD approved plumbing plan shall be submitted with your fire sprinkler plans

Site Plan Information:

- Size of city main(s), circulating or dead end and if dead end, the distance to the nearest circulating main
- City main theoretical flow test results from CSU
- Underground pipe size, length, location, material and point of connection to city main with hydraulic nodes

System Information:

- Sprinkler Legend to include: Make, type, temperature rating, K-factor, SIN and nominal orifice size of sprinklers. Sprinkler head spacing dimensions and the listed spacing used for special sprinklers
- Piping Legend to include: Pipe type and schedule of wall thickness, actual internal diameter
- Temperature rating and location of high temperature heads
- Area protected by each system on each floor and total area being protected
- Number of sprinklers on each riser per floor and total number of sprinklers per building.
- Complete riser manifold detail
- Information about backflow preventers (manufacturer, size, type) if provided, and meters
- Location and type (wet/dry, automatic/manual) of standpipe risers, outlets/valves and related equipment

- Location and details of all control valves, check valves, drain pipes and test connections
- Size, type and setting for Pressure-reducing valves
- Nominal pipe size and cutting lengths of pipe (center-to-center dimensions)
- Type of fittings, location and size of riser nipples, size of welds and bends
- Type and location of hangers, inserts and sleeves
- Hydraulic reference corresponding with comparable reference points on the hydraulic calculation sheets
- System design criteria showing **minimum** density and the design area. Also indicate the **total** water and pressure required
- For hydraulically designed systems, the information on the hydraulic data nameplate attached to the riser
- Relative elevation of sprinklers, junction points and supply or reference points
- System elevation relative to grade and other sprinkler heads, junction points and supply or reference points
- Edition year of NFPA 13D that the system was designed to.

Appendix B: Information Required on Hydraulic Calculations.

Summary Sheet

- Date, location, name of occupant, owner and building number or other pertinent identification
- Name, address and phone number of installing contractor and designer
- Description of hazard classification.
- Specific NFPA reference material for design density used in calculations
- Total water requirements for the system as calculated, at the base of the riser, defined by CSFD as being the Supply Side Pressure Gauge

System design requirements

- Design area in number of heads
- Minimum density in gpm/ ft²
- Areas of coverage per sprinkler in ft² specify if you are using actual or maximum protection area
- Spacing of sprinkler heads. When using special sprinklers, be sure to also indicate the manufacturer's minimum flow and pressure requirements, or any other unusual requirements

Detailed Worksheets – actual calculations

- Sprinkler description and K-factor
- Hydraulic coefficient used in calculations (C-factor)
- For gridded or looped systems, a sketch representing the flow quantities and direction for lines with sprinklers operating in the hydraulically most remote area
- Page numbers on every page
- Pipe size (actual internal)
- Pipe lengths (center-to-center of fittings)
- Equivalent pipe lengths for all fittings and devices used in calculations
- Friction loss in psi per foot of pipe
- Total friction loss between reference points
- Elevation head in psi at each reference point

- ❑ Velocity pressure and normal pressure if included in calculations
- ❑ Nodes to indicate hydraulic reference points, reference to other sheets, or to clarify data shown
- ❑ Flow in gpm
- ❑ Required pressure in psi at each reference point
- ❑ Combined K-factor calculations for sprinklers on drops, arm overs, or sprigs where calculations do not begin at the sprinkler

Water Supply Summary

- ❑ Location and elevation of static and residual test hydrants with relation to the riser reference point
- ❑ Static pressure in psi
- ❑ Residual pressure in psi
- ❑ Resulting flow in gpm. A theoretical flow model must be obtained from Colorado Springs Utilities
- ❑ Graphic representation showing the water supply curve and system requirements plotted on semi exponential graph paper (also known as N1.85 or hydraulic paper) so as to present a graphic summary of the complete hydraulic calculation. This graph shall include the following:
 - ❑ Water supply and PRV controlled supply curves
 - ❑ Sprinkler system demand