

# Automatic Fire Sprinkler Systems

General Requirements per Chapter 9 of the Locally Amended 2021 International Fire Code and the Applicable NFPA Codes.



## CONSTRUCTION SERVICES

1/22/24



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## **PURPOSE**

This guidance document has been developed to provide the highest level of service to the customers of the CSFD. The major goal of plan reviews is to ensure the design of automatic fire sprinkler systems meets 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 automatic fire sprinkler systems. This guidance document is not intended to provide an all-inclusive listing of submittal and inspections requirements, as it would be virtually impossible to cover all situations. This guidance document covers requirements set forth in the latest edition of NFPA 13 and may be used as guidance for submitting NFPA 13D and 13R systems as well. In addition, this document provides guidance for local requirements for standpipe systems and fire pumps. Also included is information covering items required to be included on the working drawings and supporting documents.

## **ABBREVIATIONS/DEFINITIONS**

BFP	Backflow Preventor
CD	Compact Disc
CDFPC	Colorado Division of Fire Prevention and Control
CSU	Colorado Springs Utilities
CSFD	Colorado Springs Fire Department
DISCUS	The Distilled Spirits Council of the United States
Ft <sup>2</sup>	Square feet
FDC	Fire Department Connection
FM	Factory Mutual
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
PPRBC	Pikes Peak Regional Building Code
PPRBD	Pikes Peak Regional Building Department
PSI	Pounds force per square inch
RME	Responsible Managing Employee
SIN	Sprinkler Identification Number
UL	Underwriters Laboratory

# GUIDELINES

## I. INTRODUCTION.

### A. APPLICABLE CODES AND STANDARDS.

1. 2021 International Fire Code and local amendments
2. 2022 Edition of NFPA 13 Installation of Sprinkler Systems
3. 2022 Edition of NFPA 72 National Fire Alarm Code
4. 2019 Edition of NFPA 14 Standard for the Installation of Standpipe and Hose Systems
5. 2022 Edition of NFPA 20 Standard for the Installation of Stationary Pumps for Fire Protection
6. 2022 Edition of NFPA 24 Standard for private Fire Service Mains and Their Appurtenances
7. Colorado Springs City Ordinances
8. CSFD Administrative Rulings/Interpretations

### B. ADMINISTRATIVE REQUIREMENTS.

1. **Approved Contractors.** To work in Colorado Springs, all fire sprinkler contractors must obtain a Colorado Springs Fire Suppression Contractor A (FSC-A) License to design, install, add to, alter, service, repair, and inspect automatic fire sprinkler and standpipes systems of all types as well as retrofit existing systems with backflow preventers, in accordance with PPRBC, Section 207. Please contact PPRBD, Contractor Licensing at 719-327-2887 for additional information on obtaining a license.
2. **Fire Suppression Backflow Preventers.** Contractors performing testing, maintenance, or repairs of fire suppression backflow preventers must be either licensed as a Fire Suppression Contractor A through PPRBD or obtain a Fire Suppression System Contractor-Backflow certification through the CDFPC. Only a contractor with a Fire Suppression A contractor license can design, alter, or retrofit a fire suppression backflow.
3. **Approved Installers.** All work shall be overseen by a Colorado Springs licensed Installer (FSI) and shall be on-site for all installations, additions, alterations, repair, and inspections of fire sprinkler systems, in accordance with Pikes Peak Regional Building Code, Section 207. Please contact PPRBD, Contractor Licensing at 719-327-2887 for additional information on obtaining a license.
4. **Code/Standard Editions.** Colorado Springs adopts and enforces the most recent NFPA standards. These are effective on January 1st of the year following the effective date printed in the standard.
5. **Permits/Inspections.** Required plan submittal with approvals and permits must be secured through CSFD prior to the start of any work. Permitted work must be inspected by CSFD.
6. **Special Circumstances.** Depending upon the scope of work, different types of submittals may be required; therefore, you may want to contact Fire Construction Services for additional information.
7. **Alternative Methods.** If special building conditions and/or restrictions exist that may prohibit any of the requirements set forth by adopted regulations from being met, approval from CSFD for an alternative means and methods approach is required, in written format, prior to installation.
8. **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 (IFC 901.2 & 901.4.2)

9. **Revisions.** All revisions, after approval, 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. When the Fire Inspector or field conditions necessitate a significant change to the approved plans, revisions shall be submitted for approval.
10. **As-Built Plans.** All deviations from the approved set of plans shall be clearly documented and submitted electronically to CSFD for archiving. These plans shall be clearly marked with the wording “*As-Builts*” when submitted. Minor changes to the plans are often verified as compliant during the fire inspection process and will not generally warrant submission of an as-built. As-builts will not be **reviewed** unless this has been specifically requested by the fire inspector or plan reviewer for a final review to verify compliance.
11. **Expired Permit Fees** shall follow IFC 105. See Appendix F of this document.

## 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 ensure the plan submittal package contains the necessary information for a complete plan review. Submittals may be hardcopy or electronic.

### A. CONSTRUCTION DOCUMENTS.

Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in it conforms to the provisions of the IFC, NFPA standards, relevant laws, ordinances, rules, and regulations as adopted by the City of Colorado Springs.

All plans shall be legible, dark-lined, and reproducible with conventional copying equipment. Hardcopies shall avoid colored highlighting, as these are frequently not reproducible. Electronic PDF submittals shall not be locked. All PDF documents submitted shall allow ‘flattening’ in order to lock our CSFD stamp upon approval.

When a project is associated with a building permit, sprinkler plans shall reflect the scope of work as approved under the building permit. The scopes of work must match. This is especially crucial when you have multiple permits within the same building.

When working on an existing system, you must provide details on that system such as original installation date, original requirements of the system or its intent, requirements based on occupancy and occupant load, etc.

Plans shall contain the information indicated in the checklist found within Appendix A.

### B. MINIMUM REQUIREMENTS OF A SUBMITTAL.

1. **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 Plan label (for electronic versions) or back of the construction plans (for hardcopies). Suppression system work only projects shall be indicated as such on the submittal so that it can be assigned a plan review number.
2. **Electronic submittals are now required for all projects - this began on Jan 1, 2023.**
3. **Cut Sheets/Specifications.** The cover sheet shall be signed/sealed by an RME of the licensed submitting contractor. The package is to include information on all devices that are part of or being connected to, the fire sprinkler system, such as piping, valves, hangers, method of supporting/mounting equipment, pipe, and conduit, etc. 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.

Cut sheets/Specifications shall be ordered in an organized manner, including at a minimum, the following sections:

1. Water Supply Information
2. Sprinklers
3. Piping & Fittings
4. Valves
5. Hangers
6. System Components, Appurtenances & Equipment (Pumps/ Compressors)
7. Signage
8. Fire Department Information (Special Signage, instructions, or product data)
9. Manufacturer Approved Testing Instructions.

Any section above that does not apply to the plans, may be omitted from this list.

Stamped cut sheets will be returned to the contractor and must remain with the approved plans, on the job site along with a stamped hardcopy of plans and calcs.

4. **Hydraulic Calculations.** Calculations shall contain the information and/or details indicated in the checklist in the appendix. The cover page of all hydraulic calculations shall be signed/sealed by an RME of the licensed submitting contractor.
5. **Code Study.** In some cases, CSFD will require a code study of the design criteria for the system being submitted. Most commonly, this is required in storage occupancies utilizing high pile storage and/or in-rack sprinkler systems. Each step is required to be detailed, referencing each code or standard section used in arriving at the design criteria for the sprinkler system. Be sure to show your work when increasing or decreasing densities or design areas.
6. **Water Supplies and Backflows.** Water supply information shall be obtained from CSU, or from the local water district for delegated reviews shall be provided. A copy of the CSU backflow preventer submittal form shall also be included with your plan submittal for new backflow installations within the City of Colorado Springs.
7. **Freeze Protection.** If freeze protection is being utilized to protect sprinkler piping, then the sprinkler submittal must specify the type of freeze protection being provided. Specifications for the freeze protection shall be provided as part of the submittal even if the freeze protection is being installed by another contractor.

### III. GENERAL INFORMATION AND REQUIREMENTS.

#### A. FIRE DEPARTMENT CONNECTIONS.

1. FDC's shall not be obstructed by any landscaping, parking or storage, fences, etc. at any time.
2. FDC's shall be located on the street side of buildings, fully visible and recognizable from the street or nearest point of fire department vehicle access (IFC 912.2.1). FDC's are initially located at the time that water plan reviews are performed, however, there are some instances where this location is not possible. Please contact Fire Construction Services in these situations.
3. The FDC shall be located within 40 feet of an approved fire department access road and within 100 feet of a fire hydrant that can meet the required sprinkler supply demand.
4. An exterior weatherproof electric horn/strobe unit shall be installed proximate to and within 20 feet of the FDC. The horn/strobe shall be at a height and location that is visible to responding emergency crews.
5. All standpipe and automatic fire sprinkler system FDC's shall be properly identified to clearly indicate what each component or each piece of equipment serves. One inlet for every 250 GPM in system demand shall be provided.
6. The FDC piping shall be the same size as the sprinkler riser for individual systems, or the

largest zone piping where multiple zones are supplied by a single FDC.

7. When the demand of a sprinkler system exceeds 1500 GPM, an additional FDC of the same capacity in an approved secondary location shall be provided and located as specified by CSFD. Each FDC is required to be located within 100 feet of a hydrant and 40 feet of an approved fire department access road. (IFC 912.2.3)
8. Adequate signage shall be provided identifying the exact device type and exact area(s) served, and shall comply with CSFD requirements (area of building served, pressure/flow requirements for manual standpipes, etc.)
9. Where a new Remote FDC has been approved by CSFD, a visual inspection shall be performed prior to burial of piping.

#### **B. WATER SUPPLY INFORMATION.**

CSFD will accept either theoretical or actual flow tests for fire sprinkler plan submittal and hydraulic calculations. For projects outside the City of Colorado Springs, you will need to contact the appropriate water district to obtain water supply information. The information in this report shall be dated within one (1) year. A copy of the water supply information shall be provided with your submittal package.

The water supply graph shall indicate a second curve showing a 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, including applicable hose demand, shall fall on or under the 90% water supply curve.

Fire Pumps shall be sized to supply the equipment that they serve. Where pumps serve sprinklers only, they can be sized to provide the flow for the sprinkler system, ignoring any hose stream demands. Demands of equipment not connected to the fire pump (such as outside hose demand) can be ignored except for evaluating their impact on the available water supply to the pump.

#### **C. HIGH PILED STORAGE AND HIGH CHALLENGE COMMODITIES.**

A copy of the completed high piled combustible storage questionnaire shall be provided with the submitted plans.

To expedite reviews, provide a code study on how the design criterion was determined for the sprinkler system. Information on how the design density and area were determined must be provided – this is especially critical when there are multiple adjustments for various storage arrangements. Each code section must be referenced, and all math work must be shown.

The design professional shall perform a survey of the stored commodities to ensure the design is based on the most challenging commodity stored or to be stored in the building and if used, the method of separating or isolating these commodities. The sprinkler shop drawings or technical report shall explain the criteria for determining the basis for commodity selection, how the commodities will be isolated or separated, and any design documents used such as Factory Mutual Data Sheets or fire test reports.

Ensure that the design options used/proposed will work with the warehouse operations.

1 ½" hose valves for mop up operations are not required by the adopted IFC for high pile storage occupancies.

Please reference the Plan Requirements Checklist in Appendix A for additional plan requirements of these systems.

#### **D. LIMITED AREA SYSTEMS.**

Limited area systems involve 6 or fewer sprinklers (IFC 903.3.8). These are permitted to be supplied from the domestic water system. Typically, these systems are used in medical gas rooms or other isolated hazard areas in an otherwise non-sprinkled building. References from NFPA 101, 99 and 13D are used in the review of these systems.

For protection of medical gas installations, remember the rooms are required to be ventilated, often to the exterior. Additionally, radiant heat sources are not recommended for heating of these rooms due to the fire hazard they create with the medical gases. This makes installation of wet pipe sprinklers a challenge in the least. CSFD recommends the use of dry sprinklers for these areas.

#### **E. HEALTHCARE AND STATE PROJECTS.**

When dealing with healthcare or State facilities, check with the appropriate State of Colorado agency for additional requirements that may over-ride our local amendments. Application of NFPA 101 is permitted and in some instances required. These additional requirements must be coordinated with local regulations.

#### **F. TENANT FINISH/REMODELS.**

Submittals shall include the entire project area including adjacent spaces and devices as necessary to show proper sprinkler coverage. New, added, relocated, and existing equipment shall be designated with "N" for new or "A" for adds, "R" for relocated, and "E" for existing subscripts.

Deficiencies caused by tenant finish or remodel work shall be corrected prior to final inspection. This means if the scope of work causes a deficiency in the system, that deficiency becomes your responsibility to correct. For example, a demising wall is erected for a new tenant and that demising wall creates a spacing issue of sprinklers outside the new tenant space, you must correct that spacing issue prior to final inspection. CSFD will consider this as part of your scope of work.

Additionally, you must provide the design criteria (density and operating area), the code edition the system was originally designed and installed to as well as the system demand and a current static pressure reading from the riser.

Sprinklers removed for any reason shall NOT be reinstalled per NFPA 13:16.2.1.1.

Sprinklers and diffusers have been a point of discussion for several years. If existing ordinary temperature rated sprinklers are located within 2'-6" of horizontal discharge diffusers are not being relocated as part of a remodel AND their location/temperature rating was accepted by CSFD upon their installation, they may remain. All new sprinkler heads installed as part of the scope of work for this remodel are required to meet the requirements of NFPA 13:9.4.2.5.

1. **20-Head Letters.** If the work consists of 20 heads or fewer, the work may be submitted to CSFD as a 20-head letter. See the Administrative Permit section of this document for the submittal requirements for a 20-head letter.
2. **Turning Heads Upright to Accommodate a Demolished Ceiling.** This work may be accepted on a letter. This is NOT considered a demo permit request, see the Demo Permits section below. These are considered on a case-by-case basis, please contact Construction Services for guidance as a submitted plan of the area may be required.
3. **Plugging of Heads.** This work may be accepted on a letter. These are considered on a case-by-case basis, please contact Construction Services for guidance. If plugging heads are required for "early in work" to accommodate the construction schedule, then a WAR permit will be required to perform work prior to the initial plans being submitted.

#### **G. VESTIBULES.**

Vestibules have proven to be a frustrating feature during the freezing temperatures we experience in Colorado. Vestibules that are outside the building envelope, unheated, and with no storage of saleable or combustible goods are good candidates for the omission of fire



sprinklers. Each vestibule will be reviewed on a case-by- case basis for the omission of fire sprinklers to prevent potential property damage due to frozen pipes.

#### H. EMERGENCY REPAIR WORK

Emergency repair work is defined as that minimum work necessary to return a damaged or impaired system to satisfactory and fully functional status. Emergency repair work may proceed without a permit provided the system is repaired to its original configuration, and a permit application (with submittals) is submitted by the next business day after the work is completed. In order for there to be no penalty for working without a permit, CSFD must be notified of this work.

- I. **DEMOLITION PERMIT/ LETTER.** Per IFC 105.6.1, when systems are to be removed from service, a worksheet, found here, <https://coloradosprings.gov/document/systemdemoworksheet.pdf> shall be submitted to Fire Construction Services detailing the reason(s) for the system being removed. Information on the building, occupancy classification and occupant load shall be included. See the “References and Links” section in this packet for the demo worksheet link.

A demolition letter is for work to begin on the removal of pipe, hangers, and heads prior to the approval, not for temporary removal. Demo work applies to the complete removal of a system. “Pre work”, plugging off outlets, pipe removal for allowance of other trades work, or “early in work is not considered demo and shall be performed under a WAR permit if chosen.

1. This does not allow the installation of new pipe, hangers and heads associated with a remodel, renovation, upgrade, etc.
2. A demolition letter shall accompany the demo worksheet request to provide a written description of the conditions and match specifics described in the worksheet.
3. As with all submittals to the Colorado Springs Fire Department the letter shall be on company letterhead, signed by the RME, and include the CSFD Plan Review Number.

#### J. ADDITIONAL REQUIREMENTS.

1. **Buildings under construction** shall have fire protection equipment installed and maintained in accordance with the IFC and CSFD’s new *Site Safety During Construction & Demolition* document – this document can be found here: [https://coloradosprings.gov/system/files/2023-07/2021\\_ifc\\_site\\_safety\\_2023\\_final.pdf](https://coloradosprings.gov/system/files/2023-07/2021_ifc_site_safety_2023_final.pdf)

Prior approval from CSFD shall be obtained before combustible materials are stored or moved into buildings until such time fire protection systems are operational and on-line. Factory Mutual Data Sheet 1-0 *Safeguards During Construction* and NFPA Standard 241 *Safeguarding Construction and Alteration Operations* both speak to this issue as a safe operating practice.

Having fire sprinkler and alarm systems operational prior to storage of, or moving in of, combustible materials (including but not limited to building furnishings) reduces the amount of fire, smoke and water damage should a fire occur.

Buildings requiring standpipes shall comply with the 2021 IFC section 905.3.1 and temporary standpipe(s) per 2021 IFC sections 3314.1, 33.14.12 and CSFD’s *Site Safety During Construction & Demolition* – see link above.

2. **Approved signage** must be provided on the door of the enclosure in which any sprinkler system valves/controls are located stating “Fire Control Valves” in 2-inch-high block letters with a stroke of not less than ¼ inch and a color contrasting with its background per NFPA 13: 16.17 and IFC 509.1.

Valves, switches, air vents, test connections and drains which are located within the building must also be identified in an approved, suitable, and easily identifiable method or manner at the point/location giving access to said valve or component. Signs shall be permanent, weatherproof, and appropriately secured.

A general information sign used to determine system design basis and information relative to the requirements of NFPA 25 shall be provided with a permanently marked weather-proof metal or rigid plastic sign, secured at each system control riser, antifreeze loop and auxiliary control valve. This sign shall include the following:

- Name and location of the facility
  - Occupancy classification
  - Commodity Classification
  - Presence of high-pile and/or rack storage
  - Max height of storage planned
  - Aisle width planned
  - Encapsulation of pallet loads
  - Presence of solid shelving
  - Flow test data
  - Presence of flammable/combustible liquids
  - Presence of hazardous materials
  - Presence of other special storage
  - Location of venting valve
  - Location of aux drains/low point drains for dry pipe and pre-action systems
  - Original main drain flow test results
  - Original results of dry pipe and double interlock pre-action valve test
  - Name of installing contractor/designer
  - Indicate of presence and location of antifreeze/other auxiliary systems
  - Where injection systems are installed to treat MIC or corrosion, the type of chemical, concentration of chemical, and information for proper disposal.
3. **High Pile/High Challenge** systems shall have their capabilities and limitations identified. A permanent sign shall be provided at or adjacent to each sprinkler riser. This sign shall include the following information:
- Design base or basis, including the edition used
  - A statement indicating if the sprinkler design is control mode density area method, control mode specific application, suppression mode or any combination thereof
  - When used, all the storage conditions stipulated for special designs
  - The maximum storage height
  - The minimum required aisle width
  - If storage is in racks, the maximum rack width and minimum transverse and longitudinal flue widths
  - Commodities that can be protected by the automatic sprinkler system
  - Commodities that cannot be protected by the automatic sprinkler system
  - Limits on storage heights of idle wood and plastic storage
  - Limits on storage heights of miscellaneous Group A plastics, tire and rolled paper storage
  - Locations where in-rack sprinklers are used
  - Locations where horizontal and/or vertical barriers are used
  - Information explaining the manufacturer, SIN, K-factor, and operating temperature of the overhead sprinklers protecting the high pile/high challenge storage.  
An example sign is provided in Appendix C of this document.
4. **Shell buildings** that are required to be sprinkled shall be required to be designed and installed according to the requirements set forth for “Ordinary Hazard Group II” occupancies. Upon tenant finish, these buildings may be converted to lower hazard classification, if applicable, to the occupancy or use. Since there is no way of telling who a prospective tenant will be, or what kind of hazards that tenant will be bringing into the building, this requirement is intended to mitigate those hazards which this department may be unaware of. Additionally, this ensures the density is provided for most occupancies without system upgrades. IFC 903.3.1.1.3.
5. **Non-System Components.** Sprinkler piping or hangers shall not be used to support any non-system components! This includes fire any alarm wiring. (NFPA 13: 4.8 and 17.1.3)
6. **Flexible Sprinkler Connections.** Systems utilizing flexible sprinkler connections shall be approved for such use. Hydraulic calculations or documentation shall be provided proving their use will not adversely affect the system design. This is applicable for both newly installed systems and existing systems being modified.

In lieu of submitted hydraulic calculations, you may use the Flexible Sprinkler Retrofit Analyzer (Flex Analyzer) tool available on our website. This excel spreadsheet allows you to enter key information to determine if there is a negative hydraulic impact on the system. The link to the flex analyzer can be found in the References and Links section of this document.

You shall calculate the maximum allowed bends for the length of the flex connection chosen. Failure to do so may result in disapproval of your submittal.

The Flex analyzer is not a replacement for complete hydraulic calculations on a new system. Use of the Flex Analyzer is intended for use on an existing fire sprinkler system. The Flex Analyzer shall be submitted with plans unless proof can be provided that the building was previously permitted to use flex connections.

7. **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. Reference NFPA 13: 16.3.9 for additional limitations and compatibility concerns.
8. **Reduced Pressure Backflow Preventors (BFP).** Any sprinkler system utilizing a chemical suppressant (i.e., foam), a pump, or a stored water supply in conjunction with the CSU water supply must be equipped with a reduced pressure BFP assembly. All BFP's must be listed by University of Southern California (USC) - <https://fccchr.usc.edu/list.html> and installed in its listed orientation. The reduced pressure BFP must be installed in accordance with Colorado Springs Utilities, and Colorado State Plumbing regulations.
9. **Retroactive BFP Installation.** The retroactive installation of a BFP assembly is to be in accordance with NFPA 13:30.7.5 including the retroactive installation of the Full Forward Flow requirements of NFPA 13 16.14.5.1 through 16.14.5.1.3. If the FDC bypass option is chosen by the designer, plans shall provide accurate details and product data of this configuration. Retrofits on pipe schedule systems shall be in accordance with NFPA 13:19.2.2.5.2. Submittals for these retrofits must include the following:
  - Minimum of 8 ½" x 11" riser detail
  - Current CSU Fire Flow Report with map
  - Hydraulic analysis of the system should show that the system demand with the added friction loss for the BFP and new fittings is still below the water supply curve. Documentation shall be provided to show how the existing required pressure and flow was determined.
  - Provide edition of NFPA 13 that the system was originally approved under.

This submittal process will also apply for the replacement of an existing dry, pre- action, deluge, or alarm valve where the valve replacement is not like for like.

A CSFD inspection & plan review fee shall be required for these retrofits.

10. **Pipe Replacement.** Like for like pipe replacements require submittals showing the scope of the pipe replacement, existing hydraulic calculations for the system, the edition of the NFPA 13 that the system was originally approved under, and a current CSU fire flow report (to ensure that the water supply has not deteriorated since the system was installed). If the pipe replacement involves changing the type of pipe (i.e., black to galvanized) or is going from a larger internal pipe diameter to a smaller pipe diameter, then full submittal drawings and new hydraulic calculations will be required.

A CSFD inspection is required for these retrofits, and a plan review fee will be assessed.

11. **Standpipes** Buildings requiring standpipes shall comply with IFC 905 and IFC 3314.
  - Standpipes shall be installed on the intermediate stair landings per IFC 905.4.
  - Standpipes can be manual or automatic; wet or dry, for non-high-rise buildings (IFC 905.3.1 and NFPA 14: 5.4.1.1)
  - Standpipes shall be flow tested per NFPA 14: 11.5. Where manual standpipes are

installed, arrangements shall be made with CSFD to procure the staff and fire engine to perform this flow test per NFPA 14: 11.5.2.

- Call CSFD at 719-385-5950 to make the necessary schedule arrangements and payment for use of CSFD staff and equipment to test these manual standpipes.
- The contractor is still responsible for providing all required testing equipment (hoses, hose monsters, pitot gauges, etc.
- Standpipes, where applicable, shall comply with CSFD's new *Site Safety During Construction & Demolition* document: which can be found here:  
[https://coloradosprings.gov/system/files/2023-07/2021\\_ifc\\_site\\_safety\\_2023\\_final.pdf](https://coloradosprings.gov/system/files/2023-07/2021_ifc_site_safety_2023_final.pdf)

12. **Elevator Shafts and Elevator Machine Rooms.** See Appendix D for guidance on sprinkler requirements for elevator shafts and machine rooms based on the type of elevator installed.

#### IV. INSTALLATION.

##### A. ADMINISTRATIVE PERMITS.

1. **Work at Risk.** If you need to start the installation prior to issuance of a permit, approval shall be obtained from CSFD Fire Construction Services to begin work. A letter is to be submitted to CSFD requesting the work at risk and defining the justification for the request. The approved work at risk letter shall be posted on the job site until such time the installation permit is issued (IFC 105.3.4.1). The work at risk should be the last option you turn to, to avoid abuse of the system.
  - Request for Work at Risk (WAR) shall be submitted to CSFD Fire Construction Services on the fire sprinkler contractor's letterhead with the following information provided:
    - a. Name and address of the project
    - b. CSFD plan review number
    - c. Proposed date that work will begin
    - d. Proposed work that will be performed prior to issuance of a permit
    - e. Justification for the work at risk request
    - f. Responsible Managing Employee (RME) signature
  - Other considerations for granting a Work at Risk permit are the backlog of plans waiting for review, the current number of expedited review requests in the office and the Contractor's performance history in both the quality of plans, and installations.
  - The holder of the work at risk shall be authorized to proceed at their own risk with the installation or modification of the fire sprinkler system but shall not entitle them to any required inspections of the system or work until drawings are approved and the required construction permit is posted on site.
  - Any work performed on fire sprinkler systems will be done at the risk of the installing contractor. Any required changes or modifications based upon approved plan review or inspection activities will be the responsibility of the contractor.
  - The granting of a work at risk does not eliminate the contractor's responsibility to maintain up to date red line drawings on site. Any red line modifications made prior to the contractor receiving approved plans and permit must be transcribed onto the approval plans in a timely fashion (prior to initial inspection).
  - All work performed under the work at risk must remain visible until CSFD inspection of the work after obtaining approved plans and permit.
  - An individual work at risk, a company's ability to participate in the work at risk program, or the entire work at risk program can be suspended at any time at the discretion of the Fire Code Official.
  - Work at risk will not be issued for high pile, high hazard, or high challenge systems.

2. **20-Head Letters.** If the work consists of 20 heads or fewer, the work may be submitted to CSFD as a 20-head letter and shall follow these guidelines:
  - All 20-head letters shall be submitted using the letter format template provided in Appendix A of this document.
  - 20-head letters do NOT apply to paint booths or special application systems.
  - They do NOT apply to any scope of work involving a change of use or occupancy, or any other stipulations previously mandated and/or required by CSFD.
  - 20-head letters shall be submitted a minimum of two business days before the start of the work.
  - There is a limit of ONE letter per building permit scope of work.
  - No fire inspections will be performed on this work unless a special request is made or CSFD elects to make quality control checks on the work being performed.
  - Any additions or remodels to existing commercial and residential fire sprinkler systems that involve 20 sprinklers or fewer will not require the submittal of plans or calculations through CSFD, if the conditions are clear as to the area of work. If conditions are not clear, or if there are multiple areas in the scope of work, a simple sketch shall be submitted with the letter.
  - The approved letter/sketch is your permit and shall be posted on the job site.
  - Modifications involving flexible sprinkler connections will NOT be permitted unless one of the following is provided:
    - The sprinkler system was originally designed and approved for their use.
    - Hydraulic calculations are supplied proving the addition of flex connections will not hydraulically overload the fire sprinkler system.
    - Use of the Flex Analyzer - See Appendix A in this document
  - Revisions to the scope of work conducted under a 20-head letter require a revised letter to be submitted. If the revisions cause the scope of work to exceed 20 heads, you must submit plans and obtain a full sprinkler permit.
  - At the time the work is completed, a completed installer certification and above ground certificate shall be filed with CSFD within 2 business days.
  - CSFD reserves the right to modify or delete any portion of this program as necessary for the safe monitoring and regulation of fire sprinkler system installations.

## **B. CONSTRUCTION PERMITS**

1. A construction permit is required for installation of or modification to a fire sprinkler system. Any modification requires a permit (also see 20 head letter section).
2. The installation of the fire sprinkler system is not to commence, including any pre-piping, until the working plans have been reviewed and approved by CSFD and a permit secured on site, per IFC 105.1.2.
3. Permits for fire sprinkler systems expire one year after the date of issue. A 30-day grace period is allowed to renew the permit. Appendix F, found at the end of this document provides additional clarification.
4. Permits will be issued to match the scope of work of the building permit they are associated with. For example: if there are 3 separate building permits issued for interior remodels in different areas of the same building, the fire sprinkler submittals will receive 3 separate permits, regardless of if they were submitted on one plan set or separate plan sets. This prevents failures of one scope of work holding up the final of another scope of work.
5. 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.

### C. HEAT TRACING / FREEZE PROTECTION

The installation of the heat trace must be visually inspected prior to being concealed by insulation or other coverings. The status of the heat trace (power & temperature) must be monitored by the fire alarm system. When a generator is being used, CSFD strongly recommends that the heat trace be powered by the generator to ensure proper freeze protection is provided during the time of power loss. CSFD also strongly recommends that the heat trace be fed from a dedicated 120V circuit to prevent the heat trace from being inadvertently turned off due to electrical work being performed on other items supplied by the same AC circuit.

### D. ANIT-FREEZE REPLACEMENT - New Jan. 2024

Visit this link <https://coloradosprings.gov/system/files/2024-01/2024-1.pdf> for updated information on antifreeze systems. Projects for replacement systems may be submitted into Accela as a Limited Scope (LS) project type, as is with 20 head letters, that provide adequate scope information and plans for the CSFD archives. Contractors shall be required to enter the project information into the Compliance Engine for additional requirements.

## V. INSPECTIONS AND TESTING.

It shall be the duty of the person doing the work authorized by a permit to notify CSFD that the work is ready for inspection. It shall also be the responsibility of the person requesting the inspection 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 that presume to give authority to violate or cancel the provision of this code or of other ordinances of the jurisdiction shall not be valid (IFC 108.4).

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 piping and hangers shall not be covered and/or concealed by any means prior to a visual inspection being conducted and accepted by CSFD. This includes drop in grid style ceilings! Ceilings, including finished sheet rock, will be required to be removed, if necessary, for inspection.

Where sprinkler piping is installed under breezeways for freeze protection, this piping must be visually inspected by CSFD prior to burial.

2. **Hydrostatic Test.** All piping and joints in standpipe and/or sprinkler systems, including the FDC piping, require the minimum 200-psi hydrostatic test per NFPA 13: 6.10.2.2 and 29.2.1. All pipe joints shall be exposed to expedite the verification of leak-free joints. The test shall be witnessed and accepted by CSFD.

Hydrostatic pressure shall be based on the available pressure from the city main, not the pressure after any pressure reducing valves.

Where system working pressure exceeds 150 psi, the hydrostatic test shall be performed at 50 psi in excess of the system working pressure per NFPA 13: 29.2.1.3.

Additions/Modifications to existing systems involving more than 20 sprinklers, the area shall be isolated and tested at not less than 200 psi for a minimum of 2 hours. If the area cannot be isolated, it shall be tested at the system's normal static pressure.

3. **System Operational Tests.**

**Main Drain.** Sprinkler and/or standpipe systems shall undergo a main drain test to establish a base line residual pressure for future reference in accordance with NFPA 13: 29.2.3.4.

**Trip Test.** Dry Pipe/Pre-action/Deluge valves shall undergo a working trip test or automatic

operation in accordance with NFPA 13:29.2.3.2 and 29.2.3.3.

**PRV's/BFP's** shall undergo testing to ensure proper operation per NFPA 13:29.2.4 and 29.2.5.

4. **Acceptance Testing Residential Fire Sprinkler Systems.** This policy applies to new residential fire sprinkler systems designed in accordance with the NFPA 13D & NFPA 13R.

CSFD offers two options for final acceptance testing of residential fire sprinkler systems.

- Perform a bucket test as has been a common past practice.
- Complete the following test procedures as commonly seen on commercial systems:
  - a. A main drain test.
  - b. An underground flush.
  - c. An underground hydrostatic test per installation standards.
  - d. Providing the completed Contractor's Material and Test Certificate.

#### **B. UNDERGROUND PIPING.**

1. **Visual Inspection.** CSFD does not perform a visual inspection of the underground fire lines; CSU Water Inspections will inspect the fire line and approve the burial.

Remote FDC pipe that is not tied directly into the water supply is not inspected by CSU. This piping must be visually inspected by CSFD prior to burial.

Documentation of a visual inspection by CSU shall be provided to CSFD. See CSFD's Water Supplies for Fire Protection Guidance Document for AN example of the form required to be signed by CSU.

2. **Hydrostatic Test.** The underground fire line requires a 200-psi hydrostatic test per NFPA 13: 6.10.2.2. The test shall be witnessed and accepted by CSFD. Underground piping is allowed minimum leakage in accordance with NFPA 13.

Hydrostatic testing is required for NFPA 13R systems with 4" or larger fire lines (13R: 5.3.2).

3. **Underground Flush.** Underground piping from the water supply to the riser shall be completely flushed before any connection is made to fire protection system piping (NFPA 13:6.10.2.1). In addition, any underground system piping (remote free standing FDC, pipe ran underground below breezeways, etc.) shall also be flushed before piping is connected to the system. This test shall be witnessed and accepted by CSFD.

Flushing shall continue for sufficient time to ensure thorough cleaning, usually until the water runs clear, or about 5-minutes. Be advised the CSU chlorination flush does NOT replace the CSFD required flush.

Minimum flow rate shall be not less than one of the following:

- a. Hydraulically calculated demand rate of the system, including any hose requirements.
- b. Flow necessary to achieve a velocity of 10 ft/sec in accordance with NFPA 13 Table 6.10.2.1.3. Minimum Flow Rates (Preferred method)
- c. Maximum flow rate available to the system under fire conditions.
- d. Flow rates shall comply with NFPA 20 if a fire pump is utilized (20 ft/sec).

<b>Underground Pipe Size (in)</b>	<b>Required Flow Rate (gpm)</b>	<b>Hose/Pipe Sizes</b>						
		2 1/2"	3"	4"	5"	6"	8"	
4	390	1	1	1	-	-	-	
6	880	2	2	1	1	1	-	
8	1560	4	3	2	1	1	1	
10	2440	6	4	3	2	1	1	
12	3520	8	6	4	2	2	1	

**C. COMPLETION DOCUMENTS.**

1. The completed *Contractor's Material and Test Certificate for Aboveground Piping* form shall be provided to the fire inspector at the time of final inspection. Be sure to use the updated form in the 2022 edition of NFPA 13. Previous editions will NOT be accepted.
2. The completed *Contractor's Material and Test Certificate for Underground Piping* form shall be provided to the fire inspector at the time of the underground and hydrostatic inspection. Be sure to use the updated form in the 2022 edition of NFPA 13. Previous editions will NOT be accepted.
3. An owner's manual and installation instructions covering the fire sprinkler systems equipment.
4. A copy of the completed Fire Sprinkler System Installer's Certification shall be provided to the fire inspector at the time of final inspection.
5. Permanent records such as hydraulic nameplate and general information in accordance with NFPA 13 as well as copy of NFPA 25 *Inspection Testing and Maintenance of Water-Based Fire Protection Systems* shall be provided to the building owner.



## **REFERENCES AND LINKS**

Colorado Springs Code Resources:

<https://coloradosprings.gov/fire-code-resources>

CSFD Life Safety Systems:

<https://coloradosprings.gov/fire-department/page/fire-protection-systems?mlid=31141>

CSFD Fire Sprinkler Guidance Document (this document):

<https://coloradosprings.gov/document/firesprinkler2022final.pdf>

Colorado Springs City Ordinances:

<https://codelibrary.amlegal.com/codes/coloradospringsco/latest/overview>

CSFD Administrative Fire Code Amendments and Administrative Rulings:

<https://coloradosprings.gov/fire-department/page/fire-code-amendments-and-administrative-rulings>

CSFD Demo Worksheet Document:

<https://coloradosprings.gov/document/systemdemoworksheet.pdf>

Colorado Division of Fire Prevention and Control website:

<https://dfpc.colorado.gov/>

CSU Water & Wastewater specifications:

<http://www.csu.org/>

Flexible Sprinkler Retrofit Analyzer:

[https://coloradosprings.gov/sites/default/files/inline-images/flexiblesprinklerretrofitanalyzer\\_1\\_9\\_19.pdf](https://coloradosprings.gov/sites/default/files/inline-images/flexiblesprinklerretrofitanalyzer_1_9_19.pdf)

Installer's Certification can be found on the CSFD web site at:

<https://coloradosprings.gov/fire-department/page/fire-protection-systems?mlid=31141>

High Pile Combustible Storage Permit and other various forms can be found on the CSFD web site at:

<https://coloradosprings.gov/fire-department/page/high-pile-combustible-storage-hpcs-permit?mlid=31181>

Site Safety During Construction & Demolition

[https://coloradosprings.gov/system/files/2023-07/2021\\_ifc\\_site\\_safety\\_2023\\_final.pdf](https://coloradosprings.gov/system/files/2023-07/2021_ifc_site_safety_2023_final.pdf)

## **APPENDIXES**

- A. Working Drawing Submittal Checklist
- B. Hydraulic Calculations Checklist
- C. Sample Signage for High-Pile/High Challenge Fires
- D. Fire Sprinkler/Fire Alarm Flow Chart for Elevator Shafts and Equipment Rooms
- E. 20-Head Letter Template
- F. Permit Expiration and Related Fees
- G. Air Compressor Sizing Adjusted for Elevation
- H. Dry Sprinkler Barrel length

## Appendix A

### Plan Requirements per NFPA 13 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 that these drawings were reviewed by a person registered as a RME for company.
- 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 and occupant load
- 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
- Occupancy class of each room/area as well as the Hazard/Commodity Classification
- 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
- Building key plan for interior remodels

##### 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 includes the 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. Also, total number of sprinklers on each Dry, Pre-action, Antifreeze or Deluge System
- ❑ Approximate capacity in gallons of each dry pipe and/or pre-action system
- ❑ Information about antifreeze solution used (type and amount)
- ❑ Complete riser detail
- ❑ Location, size, and piping arrangement of FDC including kind and location of alarm bells (exterior horn/strobe)
- ❑ FDC is provided with an automatic drain
- ❑ Information about backflow preventers (manufacturer, size, type)
- ❑ Location and type (wet/dry, automatic/manual) of standpipe risers, outlets/valves, and related equipment
- ❑ Location and details of all control valves, check valves, drainpipes, and test connections  
To include provisions for the Full Forward Flushing connections (NFPA 13: 16.4.5) and Air Vent locations (NFPA 13: 8.15 & 16.7).
- ❑ Make, type, model, and size of all alarm, dry, pre-action or deluge valves
- ❑ Size, type and setting for Pressure-reducing valves
- ❑ Fire Pump type (including manufacturer and model), capacity, speed, rated net pressure, diameter of impeller, inlet and outlet diameters, fuel or electrical requirements and location
- ❑ Fire Pump Test Header is provided with an automatic drain
- ❑ 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. Including any flex connections
- ❑ Type and location of hangers, inserts and sleeves
- ❑ Location of inspector's test connection and location of discharge. If discharge is to a storm drain, size of drain
- ❑ Wet system drains extend at least 4-feet into heated space, before entering an unheated space
- ❑ Dry system low point drains are provided, and the inspector test connection provides an arrangement minimizing condensation collection
- ❑ Piping provisions for flushing
- ❑ When a new system is an addition to an existing system, enough of the old system shall be indicated and included on the plans to show the total number of sprinklers to be supplied and to make all conditions clear
- ❑ Hydraulic reference corresponding with comparable reference points on the hydraulic calculation sheets
- ❑ System design criteria showing minimum density, the design area and the required water flow for hose streams, both inside and outside. Also indicate the total water and pressure required
- ❑ For hydraulically designed systems, the information on the hydraulic data nameplate attached to the riser. Show flow and pressure required at the system gauge and at the city side gauge below the backflow
- ❑ Any adjustments to the design area or density(s) based upon code provisions. Show your math, and code references for these adjustments.
- ❑ Show the math required to properly size Air Compressors for altitude corrections.

- ❑ Relative elevation of sprinklers, junction points and supply or reference points
- ❑ If room design method is used, all unprotected wall openings throughout the floor protected
- ❑ System elevation relative to grade and other sprinkler heads, junction points and supply or reference points
- ❑ Hazard or commodity classification
- ❑ Completed High-piled Packet #1 when applicable
- ❑ Edition year of NFPA 13 that the system was designed to
- ❑ A Code Study stating concise code references from IFC, IBC and NFPA documents to fully support the design being submitted.

### **Additional information for High-Pile/High Challenge Systems**

- ❑ An owner's certificate in accordance with Chapter 4 of NFPA 13.
- ❑ The design criteria (NFPA 13, Factory Mutual Data Sheets, or a specific fire test report).
- ❑ The type of design (Control Mode Density/Design Area, Specific Application, Suppression Mode, etc.), including the appropriate code references.
- ❑ Description of the stored commodities and how the commodity classification was determined (High Pile Storage Questionnaire).
- ❑ A layout of the proposed storage arrangement. If the storage is in racks, a plan and elevation detail illustrating rack heights, flue dimensions and arrangement (not required for spec warehouses).
- ❑ The aisle dimensions between each storage array.
- ❑ If a high challenge commodity is separated using fire-resistive construction, the boundary of the fire resistive construction shall be illustrated.
- ❑ A cross-section view illustrating obstruction to the ceiling sprinklers (lights, structural members, cable trays, electrical bus ducts, HVAC, etc.).
- ❑ Hazardous materials inventory statement, if applicable.
- ❑ For flammable and combustible liquids, an analysis of the miscibility of Class I liquids, the size and type of packaging, the packaging materials of construction, and if the containers have a pressure relieving mechanism.
- ❑ For Level 2 or 3 aerosols, a statement indicating that the aerosols are cartoned or uncartoned.

## Appendix B

### Information Required on Hydraulic Calculations

#### Summary Sheet

- Date, location, name of occupant, owner and building number or other pertinent identification (i.e., suite number)
- Name, address, and phone number of installing contractor and designer
- Description of hazard/commodity classification
- Specific NFPA reference material for design density used in calculations
- Total water requirements for the system as calculated, including the allowance for inside hose and outside hydrant
- Total water requirements for the system as calculated, at the base of the riser (system gauge) and the city side gauge below the backflow
- Allowance for in-rack sprinklers, GPM where applicable

#### System design requirements

- Design area in ft<sup>2</sup>
- Minimum density in GPM/ ft<sup>2</sup>
- Area of coverage per sprinkler in ft<sup>2</sup>
- 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
- For gridded or looped systems, a sketch representing the flow quantities and direction for lines with sprinklers operating in the hydraulically most remote area (i.e., peaking of grid)
- 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
- In-rack sprinkler demand balanced to ceiling demand
- 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.
- ❑ Pitot pressure in psi (if known).
- ❑ Resulting flow in GPM. A theoretical flow model must be obtained from Colorado Springs Utilities. Projects with new water infrastructure and hydrants should use theoretical flow for new hydrants to avoid unnecessary friction losses for excessive amounts of underground piping. The Civil Engineer preparing plans for the new water infrastructure should have theoretical fire flows for these new hydrants.
- ❑ Diameter of flowing orifice in inches.
- ❑ Graphic representation showing the water supply curve and system requirements, including hose demand when applicable 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 curve.
  - ❑ Sprinkler system demand.
  - ❑ Hose demand.
  - ❑ In-rack demand, if applicable.
  - ❑ Fire pump points (churn, rated, 150%).
  - ❑ Flow orifice diameter in inches.

## Appendix C

### Sample Signage for High Pile/High Challenge Systems:

#### Automatic Sprinkler System Capabilities & Limitations

<b>Stored Commodity</b>	Class I water miscible flammable liquids in 1- & 5-gallon polyethylene containers in fiberboard cartons
<b>Design Documents</b>	NFPA 13 2022 edition & NFPA 30 2021 edition Chapter 4
<b>Design Type</b>	Control Mode, Density/Area Method
<b>Max Storage Height</b>	25 feet
<b>Min. Aisle Width</b>	8 feet
<b>Max. Rack Width</b>	9 feet
<b>Flue Dimensions</b>	Longitudinal: Min 6-inches Transverse: Min 3-inches
<b>System Capabilities</b>	Class I-IV commodities, stored commodity, solid pile, or palletized Group A plastics to 12 feet; rack storage of Group A plastics to 25 feet.
<b>System Limitations</b>	No level 2 or 3 aerosols, Class 2, 3 or 4 Oxidizers
<b>Idle Pallets</b>	6 feet max storage height
<b>Tire Storage</b>	5 feet max storage height
<b>Roll Paper Storage</b>	5 feet max storage height
<b>In-Rack Sprinklers</b>	In-rack sprinklers are Tyco/Central FS-B, 17/32" orifice, QR 155°F element, SIN TY0041
<b>Horizontal Barriers</b>	Required at each rack tier containing the stored commodity
<b>Ceiling Sprinkler</b>	Tyco ELO-231B, 3/4" orifice, SR 286°F element, upright, SIN TY0030

# Appendix D

## Elevators and Fire Sprinkler/Fire Alarm Requirements

**Codes:**

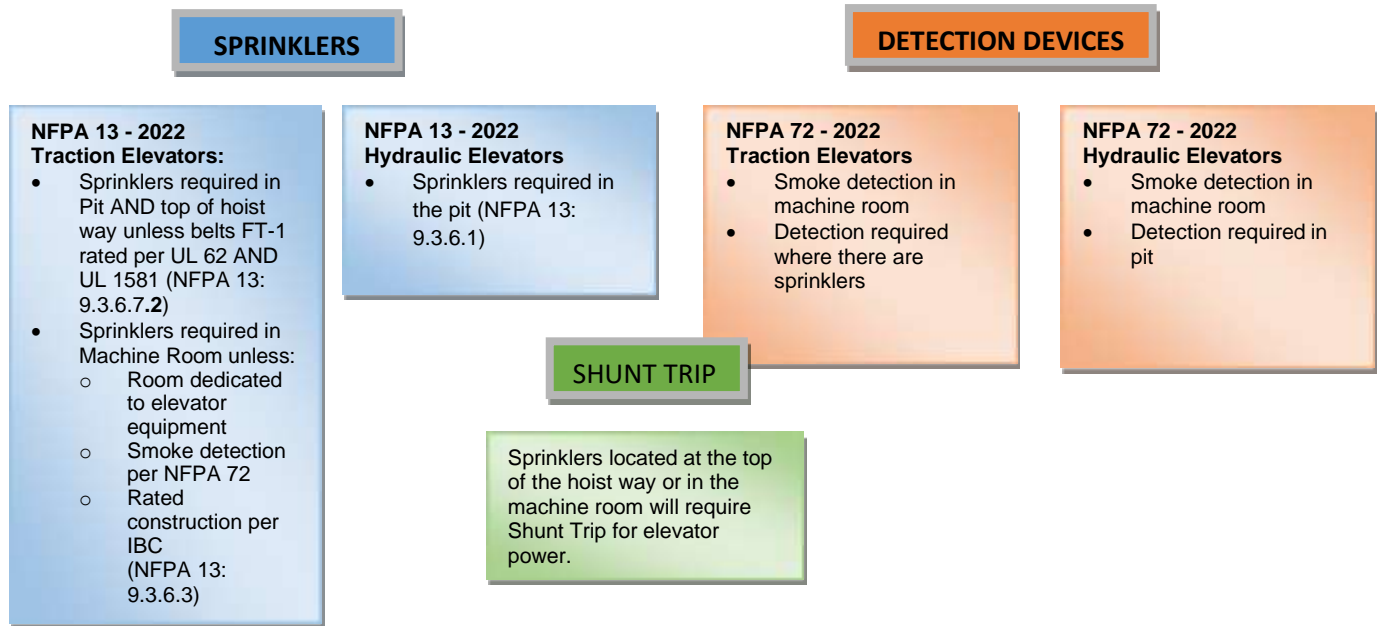
- 2022 NFPA 13**
- 2022 NFPA 72**
- 2021 IFC**

With changes in elevator technologies, the fire sprinkler and fire alarm requirements are continually trying to keep up. Different elevators have different requirements. Even different sprinkler systems have different requirements.

Buildings protected by NFPA 13R and 13D sprinkler systems do not have any special requirements when it comes to elevator protection.

2022 NFPA 13R 6.6.6: Sprinklers are not required in elevator machine rooms or shafts, where the elevator installation complies with ANSI A17.1 (Elevator code)

2022 NFPA 13D 8.3.5: Sprinklers are not required in elevator machine rooms or shafts.





## Appendix E

### CSFD Construction Services 20 Head Letter Template

Company Information:

Date:

Project Name and Address:

Area of work in the building:

Accela # /Reference Plan#:

PPRBD Permit #:

System Work

Only Reason for work:

Remodel

Deficiency

Check one for design basis:

NFPA 13

NFPA 13D

NFPA

13R System Type:

Wet

Dry

Pre-

Action

Deluge

Check one for design criteria:

Hydraulically Calculated

Pipe

Schedule Number of heads:

Added

Relocated

Plugged

Sprinkler head information: K-factor

Temp.

Thread

Flex Connections:

YES

NO

Brand:

Length of Flexible connection:

Equivalent Length per data sheet:

UL 2443/FM 1637 Complaint:

Work is scheduled to start on:

Work is scheduled to be completed by:

Scope of work:

Check to acknowledge that a sketch for the scope of work has been provided.

Signature and date by Contractor's RME:

*By providing the installing company's responsible managing employee's signature it is acknowledged that the water supply is of sufficient capacity and no hydraulic overloading exists. It is, also, acknowledged that the system will be installed in accord with all applicable local and notional codes and standards.*

# Appendix F

## Permit Expiration Fees

**Table 105.3.1**  
**Permit Expiration Fees**

<i>Time of Renewal</i>	<i>Status/Condition</i>	<i>New Plans/Permit</i>	<i>Fee Determination</i>	<i>Fees</i>
<i>Before grace period expires</i>	<i>No changes to design/contractor AND Inspections conducted within last 13 months</i>	<i>Not Required</i>	<i>Search/retrieval fee</i>	<i>*</i>
	<i>Change in Contractor regardless of inspection status</i>	<i>Required</i>	<i>Change in Design/Adopted Code: Plan Review/Permit Fees</i>	<i>*</i>
			<i>No Change in Design/Adopted Codes: Administrative Review Plus Search/Retrieval Fee</i>	<i>*</i>
	<i>Abandonment<sup>†</sup></i>	<i>Required</i>	<i>No inspections conducted within 13 months: Plan Review/Permit</i>	<i>*</i>
			<i>Inspections conducted: administrative review plus search/retrieval fee</i>	<i>*</i>
	<i>After grace period expires</i>	<i>No changes to design/contractor/ adopted codes AND Inspections conducted within last 13 months</i>	<i>Not Required</i>	<i>1/2 original plan review/permit plus search/retrieval fee</i>
<i>Change in Contractor regardless of inspection status</i>		<i>Required</i>	<i>Change in Design/Adopted Codes: Plan Review/Permit Fees</i>	<i>*</i>
			<i>No Change in Design/Adopted Codes: Administrative Review Plus Search/Retrieval Fee</i>	<i>*</i>
<i>Abandonment<sup>†</sup></i>		<i>Required</i>	<i>No inspections conducted within 13 months: Plan Review/Permit</i>	<i>*</i>
			<i>Inspections conducted: administrative review plus search/retrieval fee</i>	<i>*</i>
<i>Lost permit card</i>				<i>Duplicate card</i>

<sup>†</sup> As defined by Section 105.3.1.

\* Approved and adopted fees shall be assessed.

## Appendix G

### Air Compressor Sizing Adjusted for Elevation

(F<sub>cap</sub> Value below assumes the location as Colorado Springs, CO. Elev. Approx. 7000 asl.)

$$\text{ADJUSTED CAPACITY OF COMPRESSOR} = \frac{\text{SYSTEM VOLUME}}{F_{\text{CAP}}}$$

$$F_{\text{CAP}} = \text{CALCULATE CAPACITY FACTOR}$$

$$F_{\text{CAP}} = \frac{\text{ATOMOSPHERIC PRESSURE AT 7,000 FT}}{\text{ATOMOSPHERIC PRESSURE AT SEA LEVEL}}$$

ATOMOSPHERIC PRESSURE AT 7,000 FT = 11.33 PSI  
ATOMOSPHERIC PRESSURE AT SEA LEVEL = 14.7 PSI

$$F_{\text{CAP}} = \frac{11.33 \text{ PSI}}{14.7 \text{ PSI}} = 0.771 \text{ PSI}$$

SYSTEM VOLUME = 95.97 GALLONS

$$\text{ADJUSTED CAPACITY OF COMPRESSOR} = \frac{\text{SYSTEM VOLUME}}{F_{\text{CAP}}}$$

$$\text{ADJUSTED CAPACITY OF COMPRESSOR} = \frac{95.97 \text{ GAL}}{0.771 \text{ PSI}} = 132.96 \text{ GALLONS}$$

Revised system volume to properly size the air compressor to due to elevation.

## Appendix H

### Dry Sprinklers Barrel Length

#### CSFD Clarification on Exposed Barrel Lengths for Dry Sprinklers

Created: June 20, 2023 Effective Date: Immediately

This policy is an official interpretation of Table 15.3.1 (a) Exposed Barrel Lengths for Dry Sprinklers of the NFPA 13, 2022 edition which is adopted by reference from the IFC by CSFD.

#### NFPA 13

##### 15.3 Dry Sprinklers.

**15.3.1** Where dry sprinklers are connected to wet pipe sprinkler systems protecting areas subject to freezing temperatures, the minimum exposed length of the barrel of the dry sprinkler shall be in accordance with Table 15.3.1(a)

Table 15.3.1 (a) Exposed Barrel Lengths for Dry Sprinklers (U.S. Customary Units)

Ambient Temperature Exposed to Discharge End of Sprinkler (°F)	Minimum Exposed Barrel Length when Exposed to 40°F (in.)	Minimum Exposed Barrel Length when Exposed to 50°F (in.)	Minimum Exposed Barrel Length when Exposed to 60°F (in.)
40	0	0	0
30	0	0	0
20	4	0	0
10	8	1	0
0	12	3	0
-10	14	4	1
-20	14	6	3
-30	16	8	4
-40	18	8	4
-50	20	10	6
-60	20	10	6

The section requires two assumptions to be made for the interior and exterior temperatures. It is the opinion of this office that in typical conditioned spaces the exterior temperature is assumed to be, at the lowest, -20°F, and the lowest interior temperature the barrel is exposed to is 50° F. The result is that CSFD will expect to see a minimum of 6 inches of the exposed barrel on any installation, as measured per NFPA 13. Designers are encouraged to be more conservative as appropriate for lower temperature as seen in various areas throughout the regions within our jurisdiction.