

# **AUTOMATIC FIRE SPRINKLER SYSTEM STANDARDS (ONE- FAMILY AND TWO- FAMILY DWELLINGS) Development Standard #4.2 (Residential Installations)**

This standard applies to the design and installation of automatic fire sprinkler systems in one and two-family dwellings and manufactured homes. This standard shall be used in conjunction with NFPA 13D, Installation of Sprinkler Systems in One- Family and Two-Family Dwellings and Manufactured Homes, California Building Code 2001, California Fire Code 2001 and local amendments, and other applicable codes.

## **I. RESPONSIBILITY**

A. All individuals and companies who intend to engage in the installation or alteration of fire sprinkler systems are subject to the requirements of this standard.

B. Installer: The sprinkler system can be installed by an individual who holds a state of California C-16 (sprinklers) license or, by owner-builder of an owner-occupied, single-family dwelling.

C. Designer: Plans shall be designed by a C-16 licensed contractor or by a Registered Professional Engineer (Civil, Mechanical, or Fire Protection), licensed by the State of California (Board of Professional Engineers). All copies of the plans shall be stamped and signed by the licensed individual.

## **II. PLANS SUBMITTAL PROCEDURE**

A. Please call the Fire Prevention Office at (805) 566-2451 Monday through Thursday, 8:00 a.m. to 4:00 p.m. to obtain the appropriate fees.

B. Submit a minimum of three sets of plans, hydraulic calculations, and a transmittal form to the Fire Prevention Bureau located at 911 Walnut Avenue, Carpinteria, CA 93013. All fees shall be paid prior to issuance of approved plans.

C. Plans will be checked and if approved, will be stamped "Approved", signed and dated. The Fire District will retain one set. Plans are automatically returned via U.S. Mail. If you wish to pick up the plans, please specify, "Call for Pick Up" on your transmittal.

D. The Fire District uses location addresses for tracking all projects submitted for review. When calling the Fire District for information or status, please have the correct address available.

E. Applicant must obtain a permit from the appropriate Building & Safety Department to install the fire sprinkler system.

F. One copy of the Fire District stamped plans shall be maintained on the job site.

G. All modifications/changes to existing systems require a plan check and inspection by the Fire District.

H. Plan Check fees include the original plan check and one re-check. Please ensure that all corrections are made prior to re-submission to avoid additional fees.

I. Excessive field changes may require re-submittal of plans along with additional plan check fees.

### **III. SCHEDULING INSPECTIONS**

A. Inspection fees paid with plan submittals will provide you with three inspections to complete the project. For projects that exceed this limit, inspection requests will not be accepted unless additional fees are paid prior to scheduling an inspection.

B. It is the responsibility of the installing contractor/owner to be on the job site during the inspection with approved plans. Failure to do so will result in the cancellation of the inspection. Cancelled inspections will be counted as one inspection.

C. Inspection requests can only be taken from the installing contractor/owner.

D. Call (805) 566-2451 two business days prior to inspection for scheduling an inspection.

E. When scheduling an inspection by phone be sure to leave a return call telephone number, so the inspector can call you back to verify our inspection time.

F. Inspection times are approximate and may vary because of delays at previous inspections or emergency response by Fire District personnel. Please allow time on either side of the inspection time for the inspector to arrive.

### **IV. PLANS**

#### **A. Submittal Information**

1. To speed up the plan check process and to avoid the possibility of having the plans returned for corrections, please use the following checklist, to insure that the appropriate information is included on the working sprinkler drawings prior to submittal.

- a) Name of owner and/or occupant
- b) Location of project, including street, number, and city.
- c) Name of sprinkler installer, address, phone number, type of license and license number.
- d) Total number of square feet.
- e) Point of compass.
- f) All plans must be to scale or dimension.
- g) The scale shall be no smaller than 1/8 inch=1 foot.

- h) Plot plan showing tank, pump, structures, underground pipe size and type, point of supply connections, depth of bury, type and size of any valves or meters.
- i) Piping plan showing tank, pump, and structure elevations as they relate to each other.
- j) Full height cross-section showing building construction types, vaulted, and beamed ceiling locations.
- k) Riser detail showing system split, pressure gage, check valve, main control valve, relief valve (where applicable), main drain, and domestic shut-off valve.
- l) Water tank details including size and type of construction (where applicable).
- m) Indicate the manufacturer, model, type, and pump curve of the booster pump (where applicable).
- n) Detailed calculations.
- o) Sprinkler head spacing.
- p) Show clearly all unsprinklered areas.
- q) Indicate manufacturer, style, model, orifice size, and "K" factor of each sprinkler used.
- r) The main drain shall be a minimum ½ inch.
- s) Type of pipe.
- t) Hanger detail.
- u) Indicate type of fitting used.
- v) Size of each pipe.
- w) The main control valve shall be located above grade and readily accessible.
- x) Use of each room.
- y) Location of heat sources.
- z) Water flow information including:
  - Flow location
  - Static pressure, psi
  - Residual pressure, psi
  - Flow, gpm
  - Date / Time
  - Test conducted by or information supplied by \_\_\_\_\_.

- 2. The following information shall be contained in the hydraulic calculations.
  - a) Calculations must conform to manufacturer's specifications.
  - b) "K" factors for all sprinklers.
  - c) "C" values for the type of pipe used.
  - d) A pump curve or water supply curve, where the total demand point is clearly plotted.

3) The attached notes shall be completed and placed verbatim on the working sprinkler plans.

- a) This residential sprinkler system shall be designed and installed as per NFPA 13D and Fire District regulations.
- b) Only listed and approved devices shall be installed in this system (tanks exempted). NOTE: Installation in a manner that is not in accordance with manufacturer's specifications, require a wet stamp of a registered professional engineer, on the plans, certifying compliance with the design criteria as set forth in NFPA 13D.
- c) Only new listed residential sprinklers shall be employed in the installation of this sprinkler system.
- d) A minimum of three spare fire sprinklers of each type, temperature rating and orifice size, along with a sprinkler wrench, shall be located in a spare head cabinet at the system riser or other approved location. If less than three heads of a particular type are used, only one spare head shall be provided.
- e) All piping shall be provided with hangers and shall be supported per code and manufacturer's specifications.
- f) All piping shall be hung from structure members.
- g) All CPVC piping shall be installed by persons who have been certified by the manufacturer for installation of CPVC piping, if applicable.
- h) All primers and glues shall be listed and approved for use with CPVC piping in systems using CPVC pipe, if applicable.
- i) All valves shall have a permanently affixed sign indicating its function.
- j) Underground mains and lead-in connections shall be flushed before connection is made to sprinkler piping.
- k) A 10% reduction in the available water pressure shall be included in all calculations.
- l) Water pump shall activate automatically upon system demand and be self-priming and UL listed for electrical safety.
- m) This residential sprinkler system shall be tested and inspected at both rough and final inspection, prior to occupancy being granted. Call two (2) business days in advance to schedule all inspections.

#### B. Water Supply

- 1) All sprinkler systems shall have a single supply main serving both the automatic sprinkler system and the domestic system.
  
- 2) An additional 5 gpm shall be added to the sprinkler system demand to determine the size of common piping and the size of the total water supply requirements.

Exception: Domestic design demand shall not be required to be added where provision is made to prevent flow into the domestic water system upon operation of a sprinkler.

3) Where system piping or pumps are located in areas subject to freezing, steps shall be taken to protect system integrity; this may include, but is not limited to, heating and/or installation of insulation.

#### C. Automatic Booster Pump

1) When the domestic water supply is deficient or a water tank is being used to supply the automatic sprinkler system, an automatic booster pump may be required to maintain the required pressure at the minimum gallons per minute.

2) The pump must be automatically activated upon system demand.

3) The pump must be of self-priming type.

4) The pump must be listed or approved for electrical safety by a recognized testing laboratory.

5) When a pump is used, provisions shall be made to protect the pump from exposure to freezing and/or brush fires.

#### D. Water Storage Tanks

Refer to Carpinteria-Summerland Fire Protection District Standard 3, Stored Water Fire Protection Systems; Residential Without a Purveyor, for installation details.

#### E. System Components

1) Valves and drains.

a) Each system shall have a main control valve located on the system side of the water meter or pump. The main control valve shall be of the indicating type such as an O.S. & Y. or ball valve.

b) The valve shall control both the domestic water system and the automatic sprinkler system. The main control valve shall be readily accessible and above grade. A separate shut-off valve for the domestic shall be provided.

c) An approved rubber faced check valve shall be located on the system side of the main control valve.

d) All valves shall have an all-weather sign affixed to them, which indicate their purpose.

e) For systems with normal operating pressure in excess of 100 psi, a listed pressure relief valve shall be installed on the riser.

2). Sprinklers

a) Only new residential sprinklers that are manufactured after July 12, 2002 shall be installed. Sprinklers manufactured prior to July 12, 2002 can be used as replacement sprinklers on existing systems.

b) Garages and foyer entries shall be sprinkled.

- c) Attached garages shall be protected with listed ½" orifice intermediate rated temperature, quick response commercial sprinklers spaced at a maximum of 130 square feet each.
  - d) Sprinkler protection may be required for bathrooms dependant on size and construction materials used.
  - e) Attic sprinklers are required.
  - f) When attic sprinklers are required, the coverage per sprinkler shall not exceed 130 square feet.
  - g) In areas where ambient temperature exceeds the specifications of the listed residential sprinklers (i.e., attics, utility rooms and water heater closets), approved intermediate temperature commercial quick response automatic sprinklers shall be used. The orifice size shall be the same as the residential heads used.
  - h) Sprinkler heads in the attic under or near the peak of a roof or ceiling shall have deflectors located not more than 3 feet vertically down from the peak.
  - i) All heads in the attic area lower than 7-feet AFF (Above Finished Floor) shall be installed using head cages.
  - j) FAU catwalks are not intended for storage and shall not exceed 4-feet in width.
- 3) Pressure Gauge
- A listed pressure gauge shall be installed and maintained on the sprinkler system riser. The pressure gauge shall be installed on the system side of the check valve.
- 4) Piping
- a) When copper tubing is soldered, 95/5 solder shall be used.
  - b) Approved plastic pipe may be used when installed in accordance with the manufacturers' listings. Adequate insulation shall be provided on the attic side of the piping to avoid exposure of the piping to temperatures in excess of its rated temperature.

## F. System Design

### 1) Hydraulic Calculations

- a) Design of sprinkler systems shall include provisions for a reduction in the available water pressure of 10%.
- b) When sprinkler heads in the attic area are installed due to storage, they do not need to be calculated.
- c) In rooms/areas where depth of architectural beams create numerous pockets and it would be impractical to install sprinklers in each of these pockets, the following calculations could be used to reduce the design spacing to allow sprinkler heads be installed in the beams. These calculations apply to beams up to 12 inches in depth.

For beams greater than 12 inches, each pocket should be sprinklered based on the sprinkler head listing.

$$L' = \frac{2L}{D}$$

Where:

L': Reduced sprinkler head spacing base on installation below beams.

L: Designed sprinkler head spacing.

D: Depth of beams in the room/area.

Note: Sprinkler discharge must be at "designed spacing", L, as listed.

EXAMPLE:

Designed sprinkler heads spacing (L): 16ft x 16ft

Depth of pockets (D): 8 in.

$$L' = \frac{2 \times 16}{8} = 11.3 \text{ ft}$$

Sprinkler head spacing allowed (L'): 11.3ft x 11.3ft

Therefore, for this example, if sprinkler head spacing is reduced to 11.3ft x 11.3ft, they could be installed in 8 in. beams. Calculations shall still be done based on 16ft x 16ft coverage.

Above information must be included on the plans in the calculation format shown above including the minimum flow rate for "L" spacing.

- d) Three sprinkler heads shall be calculated in areas with sloped ceilings, if sprinklers that are not listed for sloped ceilings are used.
- e) Sprinkler heads in the garage shall be calculated to a maximum of 2 heads based on Ordinary Hazard Group 1 density.

## **V. TESTING PROCEDURE**

A. The sprinkler system shall be field tested and inspected at the rough plumbing stage (i.e. exposed pipe and fitting stage) by the Fire Prevention Bureau. All systems shall be hydrostatically tested (not pneumatic) for leakage at the normal system operating pressure at the rough stage.

B. A functional test (bucket test) shall be conducted at the rough stage from the hydraulically most demanding heads, when the overhead system is connected to the underground and the water meter is in place. The system shall meet the required flow. Exhibit A indicates how to assemble the test equipment.

C. All systems shall have an underground flush completed at time of hydrostatic test prior to connecting the underground to the overhead piping.

D. The sprinkler system and all of the related components shall be tested and inspected by the Fire Prevention Bureau at the final inspection stage, prior to occupancy being granted.

E. At least three spare sprinklers of each type, temperature rating, and orifice size used in the system and a sprinkler wrench shall be provided and located in the garage.

Exception: If less than three heads of a particular type, only that number should be provided as spare. Example: If there are two sidewalls in the residence, then provide two spares.

## **VI. MANUFACTURED HOMES AND MULTI-UNIT MANUFACTURED HOUSING WITH TWO DWELLING UNITS**

A. The Department of Housing and Community Development is responsible for plan approval, in-plant inspection, testing and installation of fire sprinkler systems installed in new manufactured housing units and multi-unit manufactured housing with two dwelling units for sale in California. Prior to shipment of a home containing a fire sprinkler system, the factory is required to affix a "Fire Sprinkler System Information and Installer Certification" label inside the unit that provides detailed information for the on-site installer and homeowner use. The label is required to be affixed on an inside wall or door of the water heater compartment.

B. The installation of a fire sprinkler system in an existing manufactured home or multi-unit manufactured home with two dwelling units requires prior design approval from the Department of Housing and Community Development and inspection approval of the installation prior to the installer covering the piping material with finished wall or ceiling materials. Only the occupant homeowner or a fire protection contractor holding a valid C-16 license may install a fire sprinkler system in an existing manufactured home or multi-unit manufactured home with two dwelling units.

C. The Fire District is responsible for the following:

1) Plan check of the water supply and underground connection to the sprinkler riser.

- 2) Review of the calculations to insure adequate water supply is available at the site to meet sprinkler system demand.
- 3) Plan check of the sprinkler system in garage areas.
- 4) Field inspection of the water supply and underground fire line to the riser.
- 5) Verification of available water supply by conducting a flow test from the inspectors test valve.
- 6) Hydrostatic test of the sprinkler system for 100 psi for 1 hour.
- 7) Field inspection of the sprinkler system in the garage area.

D. The following items shall be submitted to the Fire District for approval:

- 1) A copy of the "Fire Sprinkler Information and Installer Certification".
- 2) Three sets of site plans showing the location of underground supply line and the water source.
- 3) Calculations to prove that the available water supply will meet or exceed the required sprinkler system demand.
- 4) Fire sprinkler system plans for garages, if applicable.