



FRESNO COUNTY FIRE

PROTECTION DISTRICT

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Residential Fire Sprinkler Systems



Revised 7/15/11



Key Concepts Of Residential Fire Sprinklers

- ◆ Purpose: To provide improved protection against injury and loss of life.
- ◆ Primary goal: life safety, Secondary goal: property protection.
- ◆ When sprinklers are present, the risk of dying in a home fire decreases by nearly 80%.
- ◆ Sprinklers reduce the average property loss by 71%.
- ◆ Sprinkler systems are designed to control a fire for a sufficient time to enable people to escape. Ten minutes is considered an adequate amount of time.
- ◆ Sprinkler system piping is sized to accommodate a maximum of two sprinklers flowing plus a small domestic water allowance.
- ◆ Specially listed residential fire sprinklers and listed sprinkler system materials shall be used.

How much will it cost to install a fire sprinkler system?

The costs vary from community to community, and contractor to contractor. Some of the factors that affect the costs differences are the type of pipe used, the sprinkler heads to be installed, the location and elevation changes at the project site, the size of the home, and the contractor's costs for materials and so on. We recommend you contact different contractors and evaluate their proposed project costs.

Are there alternatives to installing fire sprinklers?

Starting January 1, 2011 California State Law requires all new one and two-family dwellings, and manufactured homes built or moved into California to have a working fire sprinkler system. There are no alternatives or exceptions to this law. It's important to recognize this law is not retroactive. Existing homes or plans for new homes submitted prior to January 1, 2011 are not required to install sprinklers under this law.



What are the typical cost for the plan review and inspections from the Fire District?

Our current fee is \$370.00 for a combination plan review and two field inspections. This fee is subject to revision.

What type of water supply system is required?

The water supply may come from a gravity tank or a well and include a pressurized tank and a pump. This configuration can be used for both fire protection and domestic uses.

In order to meet the minimum fire flow requirements a water supply would consist of a static water tank or well, a pressure tank and a pump. All fire sprinkler systems will require a pressurized tank that will hold at least 15% of the total required fire flow. The exact size of the tanks required for your system will depend on the design criteria of your sprinkler system.

The term fire flow means the required gallons of water per minute delivered at a design pressure. The fire flow for single family, two-family and manufactured residential homes is based on a flow duration of seven (7) minutes for structures less than 2,000 square feet and 10 minutes for structures greater than 2,000 square feet. The total square footage of the structure includes the roof overhangs and attached garages. A garage is considered attached if it is less than three (3) feet from the residential structure.

I'm worried the fire sprinkler system will activate when there's not a fire. Is this a reasonable concern?

We can't say an unanticipated activation will never happen but, if a fire sprinkler system is designed, installed and maintained properly the chances of an unanticipated activation are extremely low.

How many fire sprinklers will activate when there is a fire?

Only the sprinklers in the room or area of the fire will activate. Based on residential fire sprinkler designs, most rooms will have two sprinkler heads activate.

When did the requirement for the installation of residential fire sprinklers take effect?

The requirement commenced January 1, 2011. All permits for one and two-family homes obtained on or after this date shall include the installation of residential fire sprinklers. The standard for this installation is the 2010 edition of the National Fire Protection Association (NFPA) Standard #13D (The Installation of Fire Sprinkler Systems In One and Two-family Dwellings and Manufactured Homes) and the 2010 edition of the California Residential Code, Section R313.3.

Can a Plumbing Contractor with C-36(Plumber's License) install residential fire sprinklers?

No. As required by the State of California Business and Professions Code and the Contractors State Licensing Board (CSLB) only a C-16 Fire Protection Contractor may install fire sprinklers. However, if in addition to his plumber's license, he holds a valid C-16 (Fire Sprinkler) Contractor's License then a plumber may design and install a fire sprinkler system.

Who may design residential fire sprinkler systems?

A C-16 Fire Protection Contractor may design, submit plans along with a plan check submittal form, and obtain installation permits only for those systems that are installed under their license. Residential fire sprinkler system plans prepared by a California licensed mechanical or fire protection professional engineer (PE) may be used for installation purposes by any C-16 contractor. An individual homeowner may design, submit plans along with a plan check submittal form, obtain installation permits and install the fire sprinkler system. However, the homeowner cannot install the sprinkler system if the system was designed by a C-16 contractor other than the homeowner.



Which entity will review the plans for residential fire sprinklers?

For “stand-alone” systems (fire sprinklers supplied by a separate system piping from the domestic water system), the Fire District will review the plans. For “dual-purpose” systems (fire sprinklers and domestic water fixtures on the same piping system) a joint plan review will be conducted by the Fire District and the Fresno County Community Development Department.

How will the permit issuance for residential sprinkler systems be handled?

The C-16 contractor or homeowner installing the systems shall submit a Fire District Plan Check Submittal form along with five (5) sets of fire sprinkler plans, (including manufacture’s product data sheets, water flow information and hydraulic calculations) to the Fresno County Community Development Department (2220 Tulare Street, 6th floor, Fresno, CA 93721, (559) 600-4078). They will then process your plans and forward three (3) sets of your plans to the Fire District.

Is the standard tract home one (1) inch service adequate to provide water for both domestic use and residential fire sprinklers?

In many cases yes, however:

- If the one (1) inch domestic service is done in polyethylene (PE) tubing, as has been past practice, it will be more challenging for the fire sprinkler design professional due to the interior diameter of PE tubing; you may want to look into using 1 ½ “ pipe.
- A typical residential sprinkler system design will have a demand of approximately 31 gallons per minute, which includes a required simultaneous five (5) gpm domestic demand.
- Demand may be higher for house designs with sloped ceilings exceeding 4 in 12, beamed or coffered ceiling, or where sprinkler head spacing in excess of 16’ X 16’ is chosen by the design professional.
- Water purveyors may offer the option to use cooper for the connection to their water distribution system. The developer should do an optimization analysis on the fire sprinkler installation costs to determine the most economical design.
- 1-1/2” or 2” service is desirable from a fire sprinkler design perspective.

Do I need a separate water service to supply residential fire sprinklers?

No. The design standard allows use of a standard domestic water service to supply both fire sprinklers and domestic water.

We have several tracts where the utilities have been installed and we are waiting for the market to turnaround before proceeding with construction of new homes.

Will we have to change the water services?

No. However, as noted previously, the fire sprinkler design professional may need to be creative in their design which may include the use of larger pipe in the house, additional looping of lines, use of reduced spacing sprinklers with lower water demand, and, for some house designs, a booster pump may be needed.

Is an Underwriters Laboratory (UL) or Factory Mutual (FM) listed fire pump required for home fire sprinklers as is required for commercial installations?

No. However, State amendments to the installation requirements include a provision that when a booster pump is needed, it must serve both domestic water and fire sprinkler piping in order to enhance reliability of the pump. The size of pump needed will be determined by the fire sprinkler design professional based on system demand. It is anticipated a pump in the range of 40 gpm at 30 psi will be needed. For dual-purpose systems, the maximum pressure rating for plumbing fixtures must be taken into consideration in choosing a pump. The pump shall be approved for use in potable water systems in California and have brass or stainless steel operating components for reliability.

Are there any other special conditions regarding the water purveyor service that the fire sprinkler design professional should be aware of?

Yes. The design professional needs to consider the following factors:

- The hydraulic calculation for homes needs to be based on a far side service connection.
- The nominal inside diameter of SDR-9 CTS 3408 PE tubing is:
 - 1.0 inch = .863"
 - 1.5 inch = 1.245"
 - 2.0 inch = 1.629"

Is there a requirement for a special check valve or backflow prevention device for residential fire sprinklers.

Yes. A backflow device may be required by the water purveyor whenever fire sprinklers are installed. Note that the friction loss from a special check valve, a double check or reduced pressure backflow device will place severe design constraints in supplying adequate water pressure for 3rd floor residential sprinklers and plumbing fixtures without a booster pump.

Is there a 200 psi pressure test required for residential sprinkler systems as is required for commercial fire sprinkler systems?

No. Both dual-purpose and stand-alone systems may be hydrostatically tested at normal system operating pressure as required for domestic plumbing.

I have heard that there is a prescriptive design standard that may be used in lieu of hydraulic calculations for home fire sprinklers?

Yes. Both NFPA 13D and the California Residential Code allow use of a prescriptive pipe sizing method in lieu of hydraulic calculations. However, be advised that these prescriptive methods are conservative and with 40 psi for available water pressure for design purposes may not be feasible. In general, a hydraulic calculation results in smaller pipe sizing than prescriptive methods.

I required to have a separate piping system for sprinklers and domestic water or can a system be designed with common piping?

A dual-purpose piping design is allowed using the domestic water distribution system. The hydraulic calculation and piping design to assure adequate delivery of water to the sprinkler head at the minimum flow and pressure must be carefully done by the design professional. The pipe or tube and fire sprinkler fittings for dual-purpose systems must be listed for residential fire sprinklers in accordance with UL 1821.

What type of pipe or tube is required for residential sprinklers?

The water distribution pipe or tube must be UL listed for fire sprinklers for both dual purpose and stand-alone systems. The dominate material used until recently for single and duplex homes has been CPVC (Chlorinated Polyvinyl Chloride) in stand-alone piping systems. Three (3) major distributors of PEX Tubing (Uponor, REHAU, and Zurn) have received UL 1821 listings for their tubing and fire sprinkler head fittings for use in dual-purpose systems only.

Are there special requirements for hanging residential sprinkler pipe or tube?

Yes. In general, pipe or tube must be supported in accordance with the manufacture's listing or NFPA 13D as applicable. Sprinkler pipe or tube must be supported in a manner that prevents movement of the sprinkler head. For PEX tubing, the fire sprinkler head adaptor attaches to the ceiling framing members. For CPVC, there are specific hanger distance requirements for the pipe and from the sprinkler tee fitting per the manufacturer's installation guidelines. Copper pipe hanging is governed by NFPA 13D.

Is there an issue with pipe freezing or being subjected to high summer temperatures in the attic?

Yes. If you live in an area prone to freezing you will need to provide proper pipe protection. Many times pipe protection is achieved by covering the pipes with insulation. Keep in mind, pipe or tube diameters are small and could freeze even in our relatively mild winters. Manufactures also required that PEX and CPVC be protected from the excessively high attic temperature like those we experience in the valley.

Is there anything I can do to make the sprinkler heads less noticeable?

Yes! Fire sprinklers are available in a variety of styles and colors. You can even order your concealed flush mount sprinkler head covers in custom colors and designs. In almost all cases the fire sprinkler water pipes will be concealed within the walls and ceilings.



What areas of the house must have fire sprinklers?

In general, most living space within the house must be provided with fire sprinklers. A state amendment requires that sprinklers be installed in attached garages and garages located within three (3) feet of the house. Also, even if a garage is more than three (3) feet from the home, it shall have fire sprinklers if it contains living quarters. Where mechanical equipment is installed in attics, a single fire sprinkler is required to be installed over the unit. The following areas do not require fire sprinklers:

- unfinished attics not designed for storage or containing mechanical equipment
- open porches and patios
- closets less than three (3) feet deep and a total of twenty-four square feet and without mechanical equipment
- bathrooms less than fifty-five square feet

Is there a requirement for a “pilot” sprinkler head in the attic for use in detecting attic fires?

No. However, many new homes are designed with fuel fired mechanical equipment installed in the attic. A fire sprinkler head must be installed over such units within 12 inches of the roof deck. Because of attic temperatures, a commercial type quick response fire sprinkler with a minimum 200 degrees Fahrenheit temperature rating shall be used. When using non-metallic CPVC or PEX to supply this sprinkler, the pipe shall be protected with a 15 minute thermal barrier. Copper or internally galvanized steel approved for potable water may be used in this application and does not require the thermal barrier.

Is a residential fire sprinkler system required to be monitored by an alarm company?

No. There is no requirement for connection to an alarm company. Such connection is a desirable option when a stand-alone residential sprinkler system is installed.

Are there fire sprinkler system design issues that need special attention?

Yes. Your fire sprinkler system design professional needs to address issues such as ceiling fan and light fixture locations, distance of fire sprinklers from heat sources (fire places, HVAC registers, kitchen stoves, etc), and beamed or coffered ceilings. As changing of light fixtures is a common homeowner improvement, fire sprinklers need to be located a minimum of 36” from the centerline of ceiling electrical junction boxes. Under stair storage closets are often missed in fire sprinkler design.

Are the types of fire sprinklers used in a house the same as in commercial systems?

They are similar. Residential fire sprinklers are somewhat smaller, have a different discharge pattern, require less water to operate effectively, and are tested to a different UL Standard. The minimum flow and pressure for the most commonly used residential sprinkler is thirteen 13 gpm at seven (7) psi. As with commercial applications, residential fire sprinkles are available in semi-recessed or concealed configurations. Note that concealed sprinklers cannot be used in garages or areas with temperature in excess of 100 degrees Fahrenheit because the concealed plate will eventually fall off. A semi-recessed or pendent, 175 degrees Fahrenheit rated residential sprinkler is needed in these areas.

Is a separate shut-off valve permitted for the residential sprinkler system?

No. The NFPA standard is that fire sprinklers cannot be shut-off independent of the domestic water supply to the home. A shut off valve is installed before the split between sprinklers and domestic, and an additional valve is installed for the domestic lateral. This allows working on plumbing fixtures while still retaining fire sprinkler protection. You can view photos of fire sprinkler components in the following section of this document.

Is an water flow switch and an exterior alarm bell required for residential sprinkler systems?

Yes. The Fire District requires a water flow switch and an alarm bell in systems that do not include domestic service. However if a dual-purpose system is installed, then a flow switch and a bell are not necessary. This is because in dual-purpose piping systems water flows every time a domestic plumbing fixture is activated. There are listed water flow switches available now that will only activate upon flow in excess of 11 gpm (most residential fire sprinklers flow a minimum of 13 gpm), but this technology is relatively new and it's long term reliability is unknown.

While the required smoke detectors will sound an interior alarm before fire sprinklers activate, an outside bell can warn a passerby of an interior fire when the home owner is unconscious or away. You can view photos of fire sprinkler components in the following section of this document.

Is the installation of a water softener affected by the new residential fire sprinkler requirement?

For a dual-purpose piping system, a water softener device has a significant effect on available water pressure and use of such devices may be precluded. For stand-alone piping systems, the fire sprinkler piping will be connected ahead of the water softener and will have no effect on fire sprinkler operation.

Am I required to provide spare fire sprinklers at each house?

Yes. A spare sprinkler kit that contains one of each type of sprinkler used in the house and associated special wrench is required to be installed at the sprinkler riser. Also, a maintenance and user guide shall be provided to the homeowner.

Are there any additional requirements I should be aware of?

Yes. The fire sprinkler system shall be installed and maintained in accordance with NFPA Standard #13D

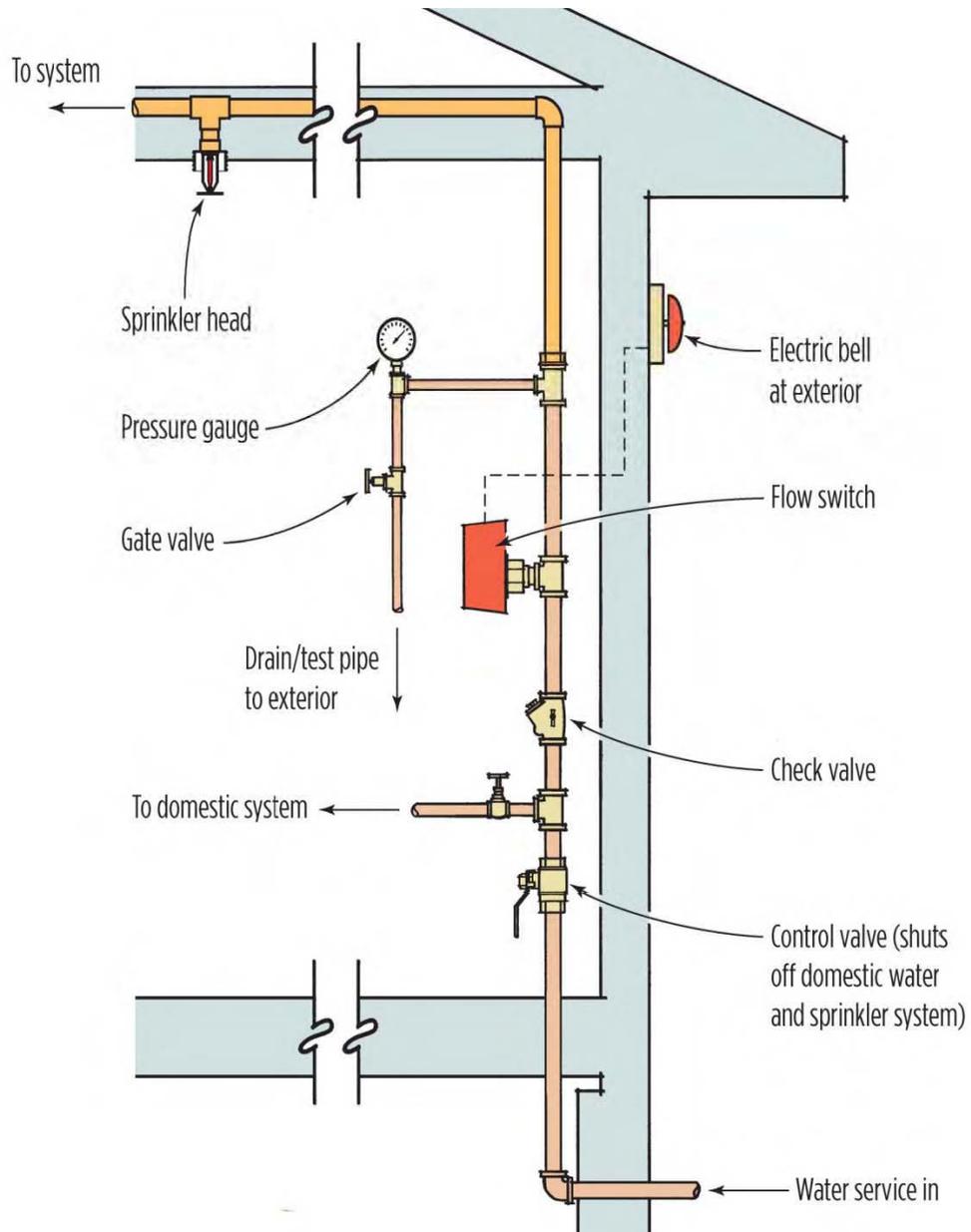
Can the Fire District help me design or draw-up the fire sprinkler plans?

We are here to assist you in the process but, unfortunately, we can not design fire sprinkler systems, draw-up plans or recommend contractors to you.



What does a residential fire sprinkler system look like?

A fire sprinkler system consists of a water supply, a water delivery system and a water distribution system. Or in other words; water, pipes, and sprinkler heads.



Examples of fire sprinkler system components

Standard sprinkler heads



Concealed sprinkler heads



A backflow preventor



Check valves



Water flow valve



Fire service/Domestic service valve



Water storage tanks



Water bladder pressure tanks



Water pump



Exterior alarm bell



CPVC pipe



PEX pipe





So what's my next step?

There are a couple of options. If you are an owner/builder you can design the sprinkler system, complete a plan check submittal form, submit the plans to Fresno County Community Development Department, obtain approval for your plans, install the sprinkler system and pass all necessary acceptance inspections.

The other option is to consult with a California C-16 licensed contractor that can design the sprinkler system, complete a plan check submittal form, submit the plans to Fresno County Community Development Department, obtain approval of the plans, install the sprinkler system and pass all necessary acceptance inspections. Keep in mind, the C-16 contractor who draws the fire sprinkler plans must be the fire sprinkler system installer.

A good contractor can walk you through the process, explain everything in detail and instill a feeling of safety in a job done right.

Attached to this document are the requirements for designing and submitting the fire sprinkler plans. Thanks for visiting us and if you have any comments or suggestion that may help others, please let us know.

Helpful Web Site Links

Fresno County Fire Protection District	www.FresnoCountyFire.org
California State Fire Marshal's Office	www.osfm.fire.ca.gov
National Fire Sprinkler Assoc.	www.nfsa.org
American Fire Sprinkler Assoc.	www.firesprinkler.org
Home Fire Sprinkler Coalition	www.homefiresprinkler.org
Globe Sprinklers	www.globesprinkler.com
Reliable Sprinklers	www.reliablesprinkler.com
Tyco Sprinklers	www.tyco-fire.com
Victaulic Sprinklers	www.victaulic.com
Viking Sprinklers	www.vikingcorp.com
CPVC Piping	www.blazemaster.com
PEX Piping	www.uponor-usa.com



“Fire Sprinklers Save Lives”

Residential Fire Sprinkler System Plan Submittal Information



Separate plan submittals are required to be submitted to the Fire District for different fire protection systems and components. The plan review fees are listed in the Fire District Fee Schedule. The fee schedule is subject to revision and for your convenience, is attached at the end of this document. Separate plan submittals are required for:

- Fire Alarm Systems
- Fire Sprinkler Systems
- Fire Suppression Systems such as Clean Agent Systems
- Fire Suppression Systems such as Kitchen Hood Systems
- Fire Service Water Supply with or without Water Storage Tanks
- Fire Pumps with a Fire Pump House
- Fire Service Water Standpipes

Plans may show systems other than the system you are submitting for permit. However, the other systems shall be called out as "For Reference Only".

Permit fees shall be paid for at the time the approved plans are picked-up from our office. Plans that cannot be approved during the first submittal will require additional submittals and resubmittal fees will be added to the base plan review fees. Permit fees shall be paid for only by check or money order. The actual permit fee will be provided to you when you are notified your plans are ready to be picked-up.

The water supply shall have the capacity to provide the required design flow rate for sprinklers for a period of time as follows:

Seven (7) minutes for a dwelling unit one story in height and less than 2,000 square feet in area.

Ten (10) minutes for a dwelling unit two (2) or more stories in height or equal to or greater than 2,000 square feet in area.

For the purpose of determining the area of the dwelling unit, the area of attached garages or garages within three (3) feet of the residence shall be considered attached. Also, any structure with habitable space, such as above a garage, shall be sprinklered. Open carports, porches, balconies, patios and similar structures shall not be included.

Where a well system, a water supply tank system, a pump, or a combination thereof, is used, the water supply shall serve both domestic and fire sprinkler systems. Any combination of well capacity and tank storage shall be permitted to meet the capacity requirement. The available water supply shall be based on the minimum pressure control setting for the pump.

The following water supply sources shall be considered to be acceptable by this standard:

- A connection to a reliable waterworks system with or without an automatically operated pump
- An elevated tank
- A pressure tank designed to American Society of Mechanical Engineers (ASME) standards for a pressure vessel with a reliable pressure source
- A stored water source with an automatically operated pump
- A well with a pump of sufficient capacity and pressure to meet the sprinkler system demand. The stored water requirement found in NFPA 13D, Section 6.1.4 permits the water storage to be a combination of the water in the well (including the refill rate) plus the water in the holding tank if such tank supplies the sprinkler system.

Where a pump and tank is the source of water supply for a fire sprinkler system but, is not a portion of the domestic water system the following shall be met:

- A test connection shall be provided downstream of the pump that creates a flow of water equal to the smallest sprinkler on the system. The connection shall return water to the tank.
- Pump motors using ac power shall be connected to a 240 Volt normal circuit.
- Any disconnecting means for the pump shall be approved by the Fire District.
- A method for refilling the tank shall be piped to the tank.
- A method of seeing the water level in the tank shall be provided without having to open the tank.
- The pump shall not be permitted to sit directly on the ground.

Where a fire sprinkler system is supplied by a stored water source with an automatically operated means of pressurizing the system other than an electric pump, the water supply may serve the sprinkler system only.

Where a water supply serves both domestic and fire sprinkler systems, five (5) gpm shall be added to the sprinkler system demand at the point where the systems are connected, to determine the size of common piping and the size of the total water supply requirements where no provision is made to prevent flow into the domestic water system upon operation of a sprinkler.

What information does the Fire District require to be on our plans?

General Information

- Property Address
- Assessor's Parcel Number (APN)
- Name and address of the property owner and/or general contractor
- Name, address, phone, fax, and license number of installing sprinkler contractor
- Community Water Systems - water pressure information and the source of the information. The information shall be submitted with the plans on 8 ½ inches by 11 inches company letterhead or official local government letterhead.
- Full height building cross section showing the location of the sprinkler heads and piping
- A Symbol Legend
- Sprinkler legend including totals of head counts for the project
- Well, pump, and storage tank information. Include a well report and data sheet for the pump.

Provide a note on the plans stating: A plastic red sign with one-eighth (1/8) inch white engraved lettering shall be secured to the wall at the main shutoff valve to the water distribution system stating the following:

“Warning, the water system for this home supplies fire sprinklers that require certain flows and pressures 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.”

Site Plan:

- All property lines, streets adjoining property, access roads, driveways, vehicle gates, etc.
- Outline of residence and any additional structures located on the property.
- North arrow.
- Location, size, pipe type, and length of underground supply line from the water storage tank to the base of the riser or water meter if a water meter is present.
- Location and size of the water meter, if applicable.
- Location, size, pipe type, and length of underground supply line from water meter to the house, if applicable.
- Location and size of the fire sprinkler riser.
- Elevation difference between the water supply connection point and the base of the riser.
- Hydraulic reference points.

The Design Basis:

- State the design basis, the coverage area, 12 x 12, 16 x 16, etc
- The number of sprinklers calculated.
- The type of sprinkler being used and its data sheet.
- The flow requirements for the chosen spacing.
- Information on special shaped ceilings (sloped, beams, soffits).
- Sprinkler locations in relation to heat zones.
- Allowable omissions with NFPA Standard or CA Fire Code sections cited.
- Proper sprinkler riser equipment with data sheets (flow switch, pressure gauge, drain).
- The underground water supply pipe sizes and lengths.
- The water meter location and size, if applicable.
- The pipe diameter and length between the water meter and city main, if applicable.

Fire Sprinkler Riser Detail:

- Location of main control valve for the domestic and fire sprinkler systems.
- Location of the domestic tie-in showing the domestic control valve.
- Location of the water flow switch, check valve, pressure gauges, and test/drain assembly.
- Location of transitions between all piping materials.
- Location of the fire sprinkler spare head box - to be next to the riser.
- Hydraulic reference points.

- Location of the fire alarm bell (for aesthetic reasons the bell does not have to be red nor does it have to be located on the front of the home. However, the bell shall be located on an exterior wall, on either side of the home, within 10 feet of the front face of the home. The bell shall be located approximately 8-10 feet above finished grade).

Piping Plans:

- All plans must be drawn to an indicated scale on a minimum sheet size of 24" x 36".
- Completely dimension the plans. Dimension the sprinkler heads off of all adjacent walls.
- Location and type of all light fixtures. Indicate the size and depth of all fixtures that are not flush with the ceiling.
- Location of all heat producing devices (i.e. fireplaces, wood stoves, ovens, ranges, diffusers, furnace, water heaters, etc.).
- Show the heat zone of each device and maintain the proper distances from these devices.
- Ceiling elevations. Clearly indicate any sloped, beamed, or special shaped ceilings.
- Indicate the degree of slope (or rise/run) on all sloped ceilings.
- Size, depth, and spacing of any exposed beams.
- Provide room names and specific use.
- Clearly indicate the use of any area or room where sprinkler protection is not being provided.
- The location of all sprinkler heads.
- All sprinklers must be spaced along the slope of the ceiling.
- Indicate the type, size, and length of all pipe.
- Indicate the type and location of all pipe hangers.
- Riser location.
- Hydraulic reference points.
- Indicate the basis for the hydraulic design (16 x 16 spacing, 18 x 18 spacing, etc.) All sprinklers must comply with the current UL 1626 requirements providing a minimum density of .05 gpm/sq ft. (The discharge requirements and number of design sprinklers shall be in accordance with the manufacturer's literature).
- Method of freeze protection.
- If antifreeze will be utilized, provide antifreeze information.

For your convenience the following antifreeze information is provided:

New Sprinkler Systems Containing Antifreeze – NFPA 13, NFPA 13D and NFPA 13R Sprinkler Systems

New systems are required to use only factory premixed antifreeze solutions. The maximum allowable concentration of glycerin for a new system is 48% by volume.

The maximum allowable concentration of propylene glycol for a new system is 38% by volume.

All factory premixed antifreeze solutions used in NFPA 13 and 13R systems must be provided with a certificate indicating the type of antifreeze, the concentration and the freezing point. Factory premixed antifreeze solutions of propylene glycol in excess of 40% by volume are permitted in ESFR (Early Suppression Fast Response) systems where the sprinklers are listed for such use in a specific application.

Factory premixed antifreeze solutions other than propylene glycol and glycerin are permitted only where they are specifically listed for use in sprinkler systems.

New systems, once installed, must be annually tested in the manner required for existing systems, summarized below.

Existing Sprinkler Systems Containing Antifreeze

NFPA13D systems must be tested annually by a qualified individual. NFPA 13D provides two alternative test procedures. In the first alternative, the system is drained and two solution samples are taken, one near the beginning and one near the end of the draining process. In the second alternative, the system is not drained and two solution samples are taken, one at the highest practical elevation and one at the lowest practical elevation of the system.

The two samples collected using either alternative procedure are then tested to verify that the specific gravity of both samples is similar. If the specific gravity of both samples is similar and if the system is found to contain factory premixed antifreeze solutions of either glycerin at a maximum concentration of 50% by volume or propylene glycol at a maximum concentration of 40% by volume (or other solutions listed specifically for use in fire protection systems), then the existing solution is allowed to remain in service. If these conditions are not met, the existing solution must be replaced with a premixed antifreeze solution of either glycerin at a maximum concentration of 50% by volume or propylene glycol at a maximum concentration of 40% by volume (or other solutions listed specifically for use in fire protection systems).

The concentration of antifreeze solutions shall be limited to the minimum necessary for the anticipated minimum temperature.

Following the annual test, a tag must be attached to the riser indicating the date of the last test, the type and concentration of antifreeze solution, the date the antifreeze was replaced (if applicable), the name and license number of the contractor that tested and/or replaced the antifreeze solution, a statement indicating if the entire system was drained and replaced with antifreeze and a warning to test the concentration of the solution at yearly intervals per NFPA 13D.

We sincerely hope this information is helpful and we wish you success with your project. Don't forget to call us at (559) 493-4359 if you have any questions or comments!

Residential Fire Sprinkler System Common Plan Review Comments And Required Corrections



1. Indicate the type and size of pipe between the water source and the base of riser or between the water meter and the city main, if applicable.
2. Provide a pressure gauge on the system riser.
3. The maximum distance the sprinkler deflector shall be located from the ceiling is four (4) inches.
4. Manufacturers of residential sprinklers publish information regarding spacing of their sprinklers with respect to heat producing devices (fireplaces, ranges, ovens, heating vents, water heaters, furnaces, etc.) Whether or not heat producing devices are shown on the plan proper minimum clearances will be required and field verified.
5. The minimum distance between any two (2) residential sprinklers shall not be less than eight (8) feet.
6. Sprinklers shall not exceed eight (8) feet from any wall. If the sprinklers are in a room with a sloped ceiling then this distance is measured along the length of the slope.
7. The maximum distance between any two residential sprinklers is 16 feet. If the sprinklers are in a room with a sloped ceiling then this distance is measured along the length of the slope.
8. The minimum distance from any sprinkler to a wall is four (4) inches.
9. Sprinklers may only be omitted from bathrooms less than 55 square feet.
10. Installation of all residential sprinklers must be in strict compliance with the manufacturer's installation requirements.
11. When residential sprinklers are installed closer than eight (8) feet apart a baffle (beam or other type of obstruction) must separate the heads.
12. The temperature rating of the sprinkler located in the sauna must be at least 50° F above the maximum ambient temperature anticipated in this room.
13. If the crawl space or attic space is designed for storage then sprinkler protection will be required.
14. Indicate the use of all rooms (or areas) where sprinkler protection has been omitted.
15. Closets exceeding three (3) feet in depth or greater than 24 square feet in area, require sprinkler protection.

16. Show all pipe, fittings, and devices between the base of the sprinkler riser and the connection to the water storage tank or city water main, if applicable.
17. Provide a manufacturers data sheet for the pump used to supply this system, if applicable.
18. The calculations currently terminate at the base of the system riser. This is not acceptable. Terminate all calculations at the connection to the water storage tank, or city water main, if applicable.
19. Based on the submitted hydraulic calculations the maximum distance a sprinkler may be located from a wall is eight (8) feet. Respace all sprinklers exceeding this limit.
20. Indicate if the kitchen light is recessed or surface mounted.
21. Indicate any sloped and/or special shaped ceilings.
22. The maximum vertical distance a sprinkler can be located from the peak of a ceiling is three (3) feet.
23. Verify a minimum of (____.__) psi on the system riser gauge.
24. Verify that the underground pipe diameters are correct and the pipe lengths are not greater than shown on the drawings. If these lengths are found to be greater than shown then revised plans and calculations will be required.
25. No allowance for domestic or irrigation use has been assumed in the calculations. If large or extended domestic or irrigation demands are anticipated then a method of turning off these flows when the sprinkler system is activated will be required.
26. Specify the use of all small, non-sprinklered rooms. Sprinklers can only be omitted from clothes closets, linen closets, and pantries.
27. Indicted the method of freeze protection for piping installed in areas subject to freezing. If antifreeze will be utilized, provide antifreeze information.

For your convenience the following antifreeze information is provided:

New Sprinkler Systems Containing Antifreeze – NFPA 13, NFPA 13D and NFPA 13R Sprinkler Systems

New systems are required to use only factory premixed antifreeze solutions. The maximum allowable concentration of glycerin for a new system is 48% by volume.

The maximum allowable concentration of propylene glycol for a new system is 38% by volume.

All factory premixed antifreeze solutions used in NFPA 13 and 13R systems must be provided with a certificate indicating the type of antifreeze, the concentration and the freezing point. Factory premixed antifreeze solutions of propylene glycol in excess of 40% by volume are permitted in ESFR (Early Suppression Fast Response) systems where the sprinklers are listed for such use in a specific application.

Factory premixed antifreeze solutions other than propylene glycol and glycerin are permitted only where they are specifically listed for use in sprinkler systems.

New systems, once installed, must be annually tested in the manner required for existing systems, summarized below.

Existing Sprinkler Systems Containing Antifreeze

NFPA13D systems must be tested annually by a qualified individual. NFPA 13D provides two alternative test procedures. In the first alternative, the system is drained and two solution samples are taken, one near the beginning and one near the end of the draining process. In the second alternative, the system is not drained and two solution samples are taken, one at the highest practical elevation and one at the lowest practical elevation of the system.

The two samples collected using either alternative procedure are then tested to verify that the specific gravity of both samples is similar. If the specific gravity of both samples is similar and if the system is found to contain factory premixed antifreeze solutions of either glycerin at a maximum concentration of 50% by volume or propylene glycol at a maximum concentration of 40% by volume (or other solutions listed specifically for use in fire protection systems), then the existing solution is allowed to remain in service. If these conditions are not met, the existing solution must be replaced with a premixed antifreeze solution of either glycerin at a maximum concentration of 50% by volume or propylene glycol at a maximum concentration of 40% by volume (or other solutions listed specifically for use in fire protection systems).

The concentration of antifreeze solutions shall be limited to the minimum necessary for the anticipated minimum temperature.

Following the annual test, a tag must be attached to the riser indicating the date of the last test, the type and concentration of antifreeze solution, the date the antifreeze was replaced (if applicable), the name and license number of the contractor that tested and/or replaced the antifreeze solution, a statement indicating if the entire system was drained and replaced with antifreeze and a warning to test the concentration of the solution at yearly intervals per NFPA 13D.

Example of a Hydraulic Calculation Summary Submittal

Hydraulic Calculations

Project Information

Project Name:	New Custom Home	Date	05/21/2010
Address:	12345 Main Street Your Town, CA	File #	Sample 2
		Index	101
Calculation Area:	Master Bedroom		

Design Criteria

Occupancy Classification:	Residential		
Construction	<input checked="" type="checkbox"/> Combustible	<input type="checkbox"/> Non Combustible	
Density:		.05 gpm/sq. ft.	
Area of Operation:		N/A	
Area per Sprinkler:		256 sq. ft. max.	
Number of Sprinklers Calculated:		2 heads	
Hose Allowance		Domestic Allowance	
0 gpm inside		5 gpm	
0 gpm outside			
Water Supply		Sprinklers	
Static	75 psi	Make:	Tyco LFII Concealed
Residual	60 psi	Size:	7/16" K=4.20
Flow	1100 gpm	Temp:	160°

Calculation Summary

Total Sprinkler Water Flow:		37.0 gpm	
Flow & Pressure	(at base of riser):	42.0 gpm @	45.2 psi
	(at city connection)	42.0 gpm @	63.1 psi

Notes: