LINCOLN FIRE DEPARTMENT

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FIRE PREVENTION STANDARD 04-02

Subject: Residential Automatic Fire Sprinkler Systems

SCOPE:
This standard is pursuant to City Municipal Code 15.04.050, Ordinance 751B Uniform Fire Code Article 10, Section 1003, for the design and installation of residential fire sprinkler in one and two family dwellings and manufactured homes. This standard shall be used in conjunction with NFPA 13D-1999, Installation of Sprinkler Systems in One and Two-Family Dwellings and Manufactured Homes, California Building Code 2001, Uniform Fire Code 2000 and local amendments and other applicable codes.

RESPONSIBILITY:

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

- 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.

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

- C-16 contractors may only design systems that the firm has a contract to install.

PLANS SUBMITTAL PROCEDURE:

- Submit a minimum of two sets of plans, hydraulic calculations; manufacture cuts sheets and listing information to the City of Lincoln Building Department at 640 5th Street, Lincoln, CA 95648.

- Plans will be checked and if approved, will be approved and the applicant will be contacted to pick them up along with the permit. The Building Department will retain one set.

- One copy of the approved stamped plans shall be maintained on the job site.

- All modification/changes to existing systems require a plan check and inspection by the Fire Department.

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

SCHEDULING INSPECTIONS:

- 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 inspections.

- Inspection requests shall be made directly with the field inspector and confirmed with the Building Department.

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

- Scheduling inspections with the inspector requires 5-days notice; however inspections may be arranged with fewer days notice depending upon the inspectors' availability.

- Inspection times are slated for AM or PM and may vary because of delays at previous inspections or unscheduled delays. Please allow time on either side of the inspection time for the inspectors' arrival.

PLANS:

SUBMITTAL INFORMATION

1. To speed up the plan check process and to avoid the possibility of returning the plans for correction, please use the following checklist, prior to submittal to insure that the appropriate information is included on the working sprinkler drawings.
    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.
    g. The scale shall be no smaller that 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 structural 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).

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m. Indicate the manufacture, model, type and pump curve of the booster pump (where applicable).
n. Detailed calculations.
o. Sprinkler head spacing.
p. Show clearly all un-sprinklered areas.
q. Indicate manufacture, style, model, orifice size and "K" factor of each sprinkler head used.
r. The main drain shall be a minimum ½ inch.
s. Type of pipe.
t. Hanger details.
u. Indicate type of fittings 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:
    i. Flow location
    ii. Static pressure, psi
    iii. Residual pressure, psi
    iv. Flow, gpm
    v. Date
    vi. Time
    vii. Test conducted by or information supplied by_____.

2. The following information shall be contained in the hydraulic calculations.
    a. Calculations must conform to manufacture's specifications.
    b. "K" factors for all sprinklers.
    c. "C" factors for the type of pipe used.
    d. A pump cure or city supply curve, where the total demand 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, 1999 edition and City of Lincoln Fire Department.
    b. Only listed and approved devices shall be installed in this system (except tanks). Should sprinklers or devices be requested to be installed in a manner that is not in accordance with the manufacturer's specifications, wet stamp of a registered professional engineer certifying compliance with the design criteria as set forth in NFPA 13D shall be placed on the plans.
    c. Only new listed residential sprinklers shall be employed in the installation of this sprinkler system.

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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 of other approved location. If less that 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 structural 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 connections 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.

4. Water Supply

a. All sprinkler systems shall have a single supply main serving both the automatic sprinkler and the domestic system.
b. 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*.
c. Where system piping or pumps are located in areas subject to freezing, steps shall be taken to protect system integrity; this may include, but not limited to heating, and/or installation of insulation.

5. Automatic Booster Pump

a. 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.
b. The pump must be automatically activated upon system demand.
c. The pump must be of self priming type.
d. The pump must be listed or approved for electrical safety by a recognized testing laboratory.

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e. The power supply providing power to a water storage tank pump shall be from the house meter and shall be equipped with a circuit breaker lock-out device that is clearly labeled “fire pump” and painted red.
f. When a pump is used, provisions shall be made to protect the pump from exposure to freezing.

6. Water Storage Tanks

a. Each tank shall have connection to a supply source to refill the tank automatically.
b. If the storage tank is atmospheric, a secondary pump shall be provided which shall be capable of providing the sprinkler system demand for 10 minutes plus 125 gallons for domestic use.
c. If the storage tank is pressurized, indicate what the discharge pressure range is (I.E. what pressure does the pump start up and what pressure does the pump shut off – this is usually 20 psi increments such as 40 and 60 psi).
d. Water tanks shall be sized to maintain a minimum of 10 minute fire sprinkler supply plus 125 gallon domestic supply.
e. Tanks located in garages and subject to vehicle damage shall have bollard(s) installed to protect the tank. The bollard shall be a minimum of 4-inch diameter steel post, 6-feet in length, set 3-feet into the ground in a 12-inch diameter hole filled with concrete including the post.
f. The power supply providing power to a water storage tank pump shall be from the house meter and shall be equipped with a circuit breaker lock-out device that is clearly labeled “fire pump” and painted red.

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.
b. The valve shall control both the domestic water supply and the automatic sprinkler system. The main control valve shall be readily accessible and above grade. A separate shut-off valve for the domestic may be provided.
c. An approved check valve (rubber faced or Teflon) 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 indicates their purpose.
e. For systems with normal operating pressures in excess of 100 psi, a listed pressure relief valve shall be installed on the riser.

2. Sprinklers

a. Only new residential sprinkler that are manufactured after July 12, 2002 shall be installed. Sprinkler manufactured prior to July 12, 2002 can be used as replacements on existing system installed prior to July 12, 2002.

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b. Attached garages and accessory buildings shall be sprinklered.
c. Attached garages and accessory buildings shall be protected with 200 degree F, quick response, 7/16 inch orifice (K=4.0 to 4.5) with a maximum spacing of 130 to 150 square feet per sprinkler.
d. Pilot fire sprinkler protection shall be provided in all attic spaces. Pilot sprinkler locations shall be near the peak(s) of the attic and located above or adjacent to the attic access points.
e. Pilot fire sprinkler sprig ups or risers shall be braced in accordance with pipe manufacturers' recommendations for vertical support and within four to six inches of the fire sprinkler when the vertical riser exceeds 30 inches vertically.
f. Attics may require additional sprinkler protection based upon field inspections for use.
g. When attic sprinklers are required, the coverage per sprinkler shall not exceed 130 square feet.
h. In areas where ambient temperature exceeds the specifications of the listed residential sprinklers (i.e. attics, utility rooms' heater closets 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.
i. Sprinkler heads in the attic under or near the peak of a roof or ceiling shall have deflectors located not more that 3-feet vertically down from the peak.

3. System Attachments

a. A listed pressure gage shall be installed and maintained on the sprinkler system riser. The pressure gage shall be installed on the system side of the check valve.
b. A minimum of three spare sprinkler heads of each type used shall be provided at a location near the riser or located in the garage.
    i. ***Exception:*** If less than three heads of a particular type, then only that number should be provided as spare.
c. Install the flow switch a minimum of 6-inches away from any 90 degree ell. The flow switch shall be connected to an audible/visual indicating device with a minimum of 75 candela rating and 75 dBA audible horn.
d. The system audible/visual device shall be located on the address side of the dwelling facing the roadway fronting the property.

4. Piping

a. When copper tubing is soldered, 95/5 solder shall be used.
b. Approved CPVC plastic pipe may be used when installed in accordance with the manufactures listing when installed in attics. Adequate insulations shall be provided on the attic side of the piping to avoid exposure of the piping to temperatures in excess of its rated temperature.

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5. System Design

a. Hydraulic Calculations

i. Design of sprinkler systems shall include provisions for a reduction in the available water pressure of 10%

ii. When sprinkler heads in the attic area are installed due to storage, they do not need to be calculated.

iii. Three sprinkler heads shall be calculated in areas with sloped ceilings, if sprinkler that are not listed for sloped ceilings are used.

iv. Sprinkler heads in the garage shall be calculated to a maximum of 2 heads based on Light Hazard Density.

v. 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.

$$L` = \frac{2L}{\sqrt{D}}$$

Where:
L1: Reduce sprinkler head spacing based 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 inch

$$L` = \frac{2 \times 16}{\sqrt{8}} = 11.3 \text{ ft.}$$

Sprinkler head spacing allowed (L`): 11.3ft x 11.3 ft
Therefore, for this example, if sprinkler head spacing is reduced to 11.3ft x 11.3ft, they could be installed in 8 inch beams. Calculations shall still be done based upon 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.

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6. Testing

a. The sprinkler system shall be field tested and inspected at the rough stage (i.e. exposed pipe and fitting stage) by Fire Prevention Bureau. All systems shall be hydrostatically tested (not pneumatic) for leakage at 150 psi for 30-minutes at the rough stage.
b. All systems shall have an underground flush completed at time of hydrostatic test prior to connecting the underground to the overhead piping.
c. The sprinkler system and all of the related components shall be tested and inspected by the Fire Prevention Bureau prior to final inspections stated and prior to occupancy being granted.

MANUFACTURED HOMES

d. The Department of Housing and Community Development is responsible for plan approval, in-plant inspections, testing and installation of the 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 provided detailed information for the on-site installed and homeowner use. The label is required to be affixed on an inside wall or door of the water heater compartment.

e. The installation of a fire sprinkler system in an existing manufactured home or multi-unit manufactured home with two dwelling units required prior design approval from the Department of Housing and Community Development and inspections 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.

f. The City of Lincoln Fire Department is responsible for the following:

i. Plan check of the water supply and underground connections to the sprinkler riser.
ii. Review of the calculations to insure adequate water supply is available at the site to meet sprinkler system demand.
iii. Plan check of sprinkler system in attached or detached garage area.
iv. Field inspection of the water supply and underground fire line to the riser.
v. Verification of available water supply by conducting a flow test from the inspector test valve.
vi. Hydrostatic test of the sprinkler system at 100 psi for 1 hour.
vii. Field inspection of the sprinkler system in the garage area

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g. The following items shall be submitted to the City of Lincoln Fire Department for approval.

   i. A copy of the “Fire Sprinkler Information and Installer Certificate”.
   ii. Three sets of site plans showing the location of underground supply line and the water source.
   iii. Calculations to prove that the available water supply will meet or exceed the required sprinkler system demand.
   iv. Fire sprinkler system plans for attached or detached garages, if applicable.