



fire design solutions

technical
specification
residential
sprinkler systems

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At FDS, our technically advanced solutions put us at the forefront of the sprinkler systems sector ...

Residential Sprinkler Systems

The Approved Document B 2007 (ADB) introduced the requirement for sprinklers in residential apartment buildings with floors 30 metres above ground level. The ADB references British Standard 9251:2005 on guidance for a code compliant approach to the Building Regulations.

Sprinklers operate by means of a fusible temperature link located within each sprinkler head that expands on heating, causing the sprinkler head link to break. Water is then automatically expelled to the seat of the fire and surrounding areas suppressing it. This allows the fire size to be controlled, satisfying the objectives of the ADB.

Systems

The system consists of a pump, tank, water supply, an automatic alarm, pipe work and sprinkler heads. FDS have developed a number of cost-effective systems ranging from a basic, British Standard compliant system, to an enhanced double knock, life safety system that reduces the risk of malicious activation and allows 'trade-offs' including open plan living, extended travel distances, reduced compartmentation and reduced smoke shaft sizes.

Early consultation with FDS is essential so that the correct system is selected, lighting positions agreed, correct water storage selected and the domestic water pipe work distribution networks agreed.

WRAS Certification

It is essential where the sprinkler system shares the boosted cold water system, every component including piping, sprinkler heads, flow switches and priority demand valves are WRAS Certified.

Facts

- Sprinkler heads are operated by temperature rated fusible links and only the heads adjacent to the fire will operate
- Sprinkler heads use 1/20 of the quantity of a fireman's hose, thus water damage is substantially less
- Fire statistics have shown that 306 people lost their lives in unsprinklered residential fires from April 2010 - March 2011 compared to a current figure of zero in sprinklered residential fires
- Research over a 10 year period in the USA (which has a long history of using residential sprinklers) has shown that in residential fires
 - Zero fire deaths have occurred
 - 99% success in controlling fire size
 - 80% reduction in fire injuries

Source: Fire Sprinkler Association and National Statistics



Queensland Road, Islington, London.

Design Standards

Sprinkler systems are relatively straight forward and can form a standalone system or form an extension of the domestic water distribution network. The general design standard is the British Standard BS9251 or NFPA13D which is summarised below. Reference should be made to the British Standard, NFPA and the Water Regulations 1999 for a more detailed understanding.

- A flow rate through one sprinkler head of 60 l/m
- A flow rate through 2/4 sprinkler heads of 42 l/m through each depending on classification (Domestic/ Residential)
- The above flow rate plus 52 l/m should be achieved through the delivering pump
- The water storage should be for 10/30 minutes depending on classification (Domestic/Residential)
- A minimum pressure of 0.5 bar at the sprinkler head of discharge
- A sounder may be required in the apartment following operation of the sprinkler head
- Sprinkler heads need to be located 2m from a wall & 4m between the heads (can be increased on agreement with the approving authorities)
- The pipe work can be of copper, PEX or CPVC
- Where the system utilises the cold water boosted system, the sprinkler leg needs to be isolated from the domestic supply by the appropriate WRAS approved check valve. The sprinkler heads, priority demand valves, flow switches and piping needs to be WRAS approved



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standards that are far from standard

Sprinkler Systems

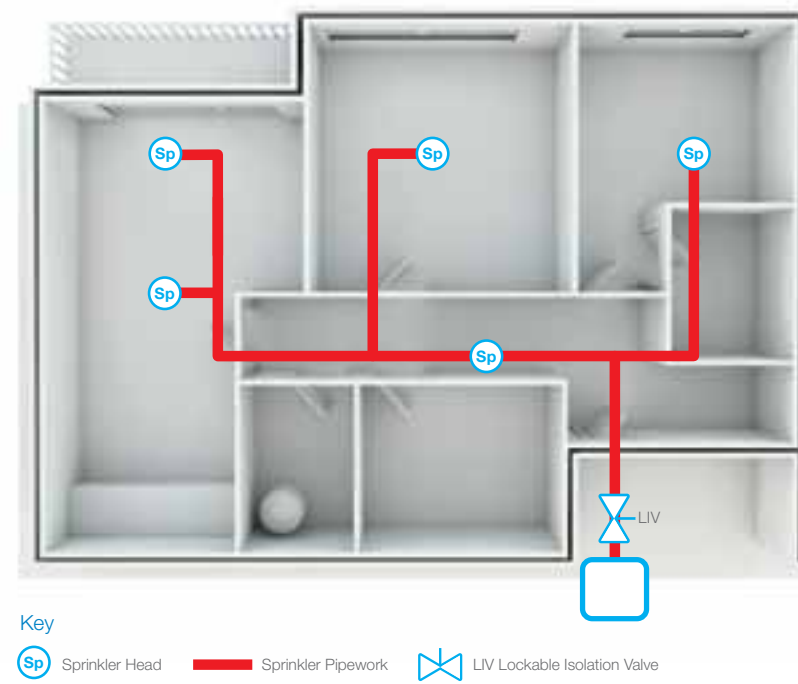
There are a number of systems which would satisfy the Sprinkler Requirements for Domestic/Residential developments. As some of the systems are engineered based on approval, the concept needs to be agreed prior to installation.

- BS1 Standalone Sprinkler System
- FS01 Floor Sprinkler System running off Cold Water Boosted Mains
- ABS01 Apartment Sprinkler System running off Cold Water Boosted Mains
- Open-Plan living Sprinkler System



Room with concealed sprinkler head (image courtesy of St James).

FDS BS1 Standalone Sprinkler System



The FDS BS1 Standalone Sprinkler System follows the guidance of the British Standard in full and forms an approved concept. The system utilises a standalone water distribution system and consists of a dedicated sprinkler water storage tank, pump and control panel, vertical and horizontal pipe work and sprinklers.

On operation of a sprinkler head, water flows through the pipe work discharging water to the seat of the fire via the sprinkler head.

FDS FS01 Floor Sprinkler System running off Cold Water Boosted Mains

The FDS FS01 Floor Sprinkler System utilises a cold water boosted storage tank, pump and vertical cold water boosted mains up to the floor manifold, much like a traditional system. The floor manifold is fitted with a tee connection, from which one pipe runs to the domestic water manifold and on into each apartment (a) and a second runs to the floor sprinkler circuit. (b) (as shown opposite)

The connection to the sprinkler circuit (b) is fitted with a BSP lockable isolation valve, a double check valve and a pressure-reducing valve. There are further isolation valves above the entrance door for each apartment, from which water is distributed to the sprinkler network inside.

Depending on the cold water design, it may be necessary to fit a 2 port priority valve. Alternatively the pumps can be oversized. It is recommended that the pumps are powered by a maintained power supply. **The schematic of the system is shown below.**

System Requirements from Client

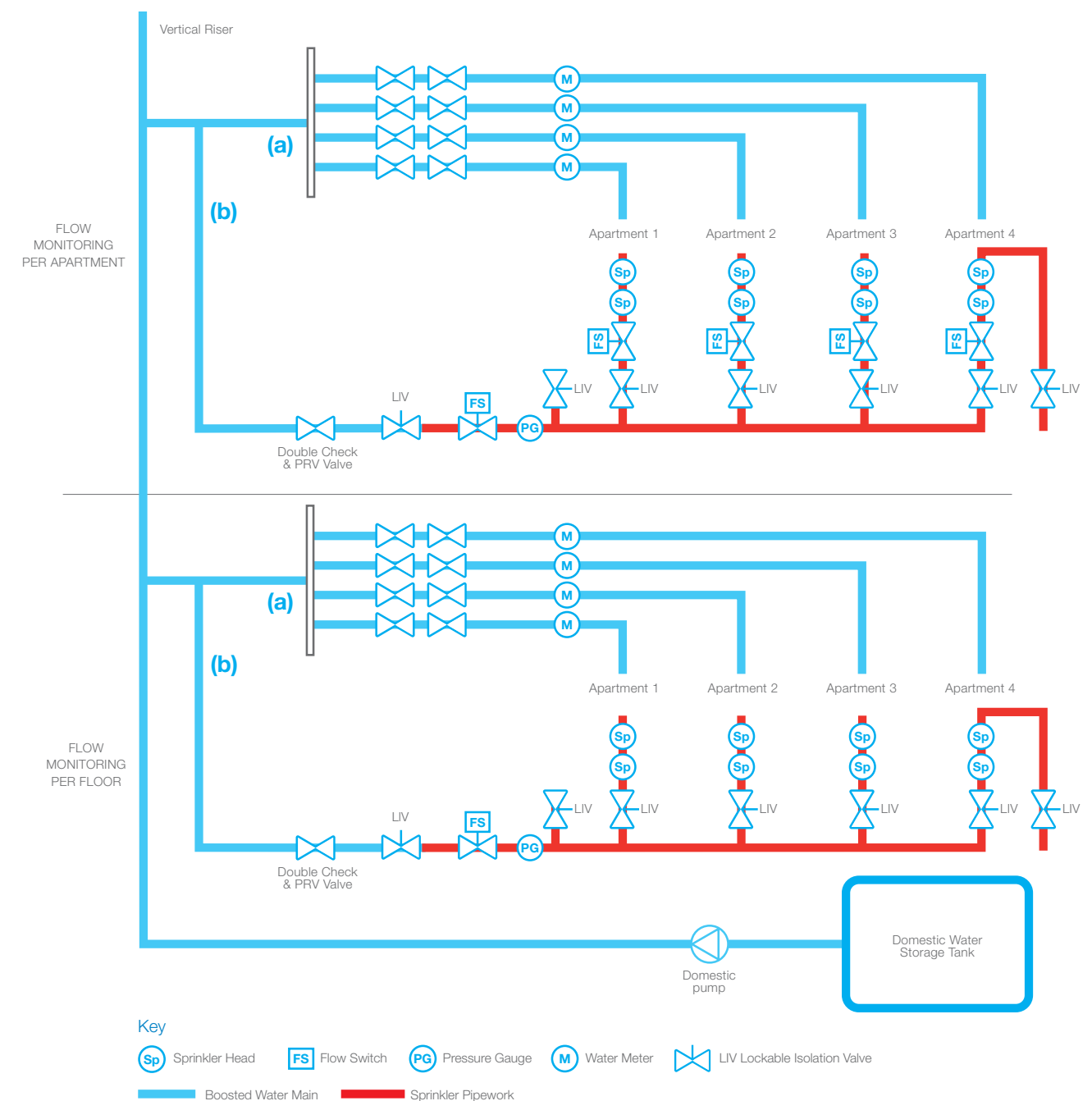
- Piping as identified below
- A 13amp fuse spur adjacent to the lockable isolation valve in each floor meter room where a priority valve is fitted
- A flow rate of 1.7 l/s (Domestic) or 3.4l/s (Residential) and a pressure of 4 bar at the FDS connection point on each floor
- The above flow rate should be achieved over that of the maximum estimated peak demand where a priority valve is not utilised

The system offers the following advantages

- A cost effective sprinkler solution to meet Approved Document B
- The apartment can be sprinklered from the cold water boosted main
- Minimised component requirement: floor zone valve, pressure reducing/check valves, flow switch, pressure gauge and the floor sprinkler network within the corridor and apartment
- The sprinkler water storage tanks and pumps can be omitted
- The vertical sprinkler pipe work can be omitted
- As the water meters are not used, no upgrade is required

It is worth noting that on operation of a sprinkler head where a priority valve is fitted, all the domestic water to the relevant floors will be isolated automatically.

FDS FS01 Floor Sprinkler System running off Cold Water Boosted Mains



FDS ABS01 Apartment Sprinkler System running off Cold Water Boosted Mains

The FDS ABS01 Apartment Sprinkler System utilises the cold water boosted storage tanks, pumps and vertical & horizontal cold water boosted mains up to the front door of the apartment and into a cupboard just like any normal domestic installation as shown below.

A tee is provided with one leg distributing to the domestic water units. The other leg terminates in a BSP full bore lockable isolation valve which connects to the sprinkler unit.

The sprinkler main provides distribution to the sprinkler heads and terminates in the isolation valve.

The client can extend this to the WC when they receive approval from the water company and turn the system into a self testing system.

All the components on the sprinkler leg have WRAS certification and the concept is to WRAS standards.

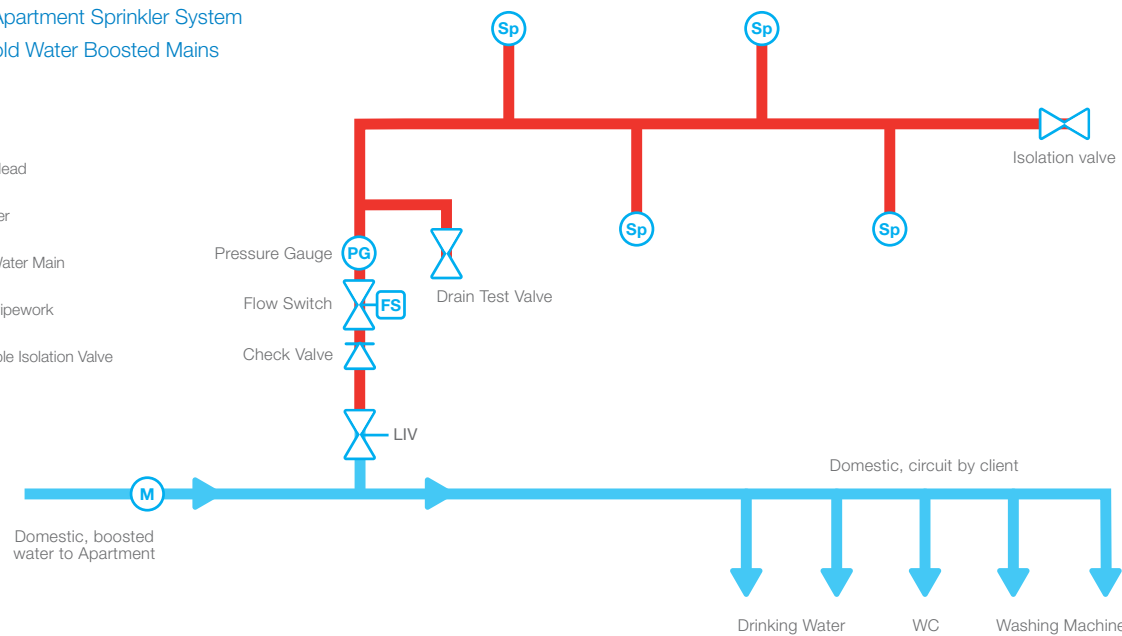
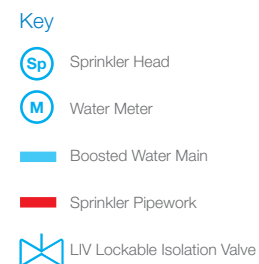


Queensland Road, Islington, London.

System Requirements from Client

- A flow rate of 2 l/s (Domestic) or 4 l/s (Residential) and a pressure of 3 bar at the Sprinkler test valve
- A water meter capable of passing the above flow rate
- The above flow rate and pressure should be achieved over that of the maximum estimated peak demand in the last apartment at the end of the index run

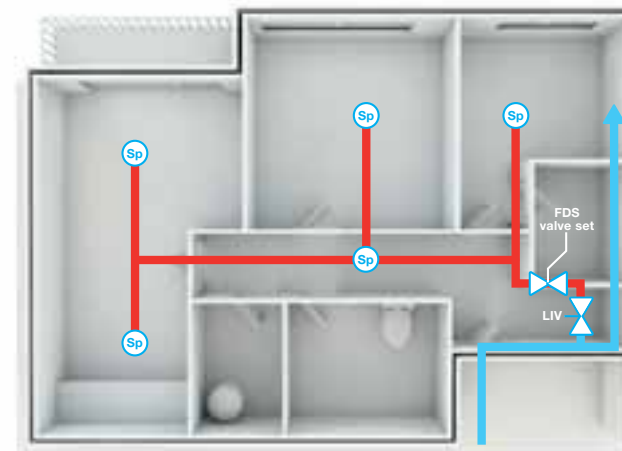
FDS ABS01 Apartment Sprinkler System running off Cold Water Boosted Mains



The system offers the following advantages

- A cost-effective sprinkler solution to meet Approved Document B
- All the sprinkler components are WRAS approved
- The concept is acceptable to WRAS & Water Companies
- The apartment is sprinklered from the cold water boosted mains
- No additional components are required apart from the sprinkler unit and the sprinkler network within the apartment
- The sprinkler water storage tanks and pumps can be omitted, saving floor area
- The vertical and horizontal sprinkler pipework can be omitted saving riser space
- Where a dedicated sprinkler system is installed, faults could go unnoticed, whereas with this system people cannot function within the apartment without water ensuring faults are quickly modified
- Flow rate and pressure can be measured within the sprinkler unit in each apartment
- The apartment sprinkler system requires minimum maintenance

Floor plan for an apartment utilising a FDS ABS01 Apartment Sprinkler System



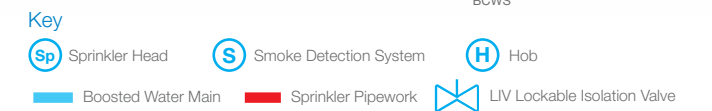
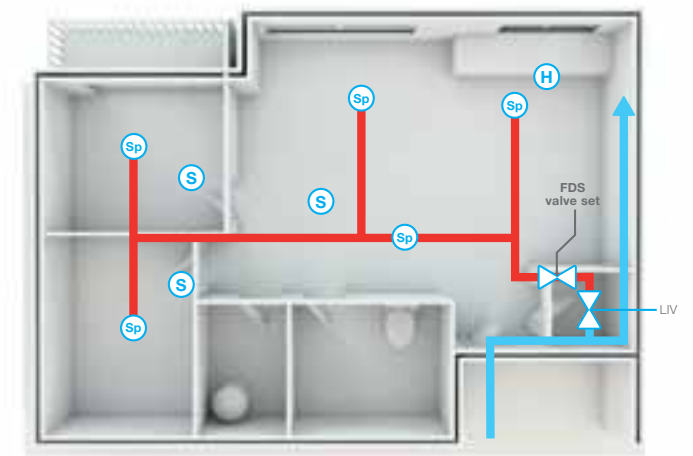
The system can be fitted with a flow switch which would be tied into the apartment detection system in order to operate an alarm or the common landlord detection system. This allows activation to be quickly identified on the building fire alarm. Similarly, the system can be upgraded to a maintenance free flushing system or an engineered double knock concept, to minimise water damage should a head be vandalised.

Open-Plan living Sprinkler System

Apartments can be constructed as open-plan living areas omitting the requirements for a protected entrance hall and fire resistance to the bedrooms & halls. This allows entry through the front door into the living space as shown.

The FDS open-plan Sprinkler System is similar to the above ABS01 Apartment Sprinkler system, but in addition to the ABS01 sprinkler system, an LD1 smoke detection and sounder system is provided that raises the necessary alarm to get people moving prior to the activation of the sprinklers.

The system offers the major advantage in that it allows open-plan living, omission of the compartmented entrance hall, omission of internal fire doors, omission of fire resistant walls and associated collars.



Cost Comparison

Although the above systems provide a similar solution, engineered the right way you can achieve better results. These range from space saving to allowing greater flexibility in the layout as seen earlier.

In addition to the above, cost also needs to be considered. The following summarises average install costs per apartment, based on a 12 storey high residential building with 7 mixed 2 and 3 bedroom apartments per level.

- Cost per apartment for the Standalone Sprinkler BS1 System **£1,510**
- Cost per apartment for the Floor Sprinkler FS01 System **£810**
- Cost per apartment for the Apartment Sprinkler AS01 System **£880**

This clearly illustrates that an engineered solution provides greater benefits all round.



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