

GUIDANCE DOCUMENT ON WATER SUPPLIES TO DOMESTIC AND RESIDENTIAL SPRINKLER SYSTEMS

1. Background to growing use of residential sprinklers in the UK.

Sprinklers have been installed in the UK for over 100 years to reduce the cost of fires occurring in industrial and commercial premises. Tens of thousands of systems are currently installed in factories, warehouses, shops and offices.

In recent years, quicker responding 'residential' type sprinklers have been developed and used widely in the USA and Australia. There is now recognition that the extensive use of residential sprinklers could significantly reduce the annual loss of about 500 lives, together with 15000 fire casualties, in dwellings in the UK.

The publication of the British Standard DD251:2000 **Sprinkler systems for residential and domestic occupancies — Code of practice**, has given an impetus to the installation of these systems. The fire services and the Home Office fire service inspectorate (now incorporated within The Office of the Deputy Prime Minister), among others, are strongly supporting the introduction of residential sprinklers. It is estimated that about 3000 systems were installed in 2001.

Systems are being installed in **domestic** (single family) occupancy and **residential** (multi occupancy) residential dwellings such as:

New domestic dwellings, small and large estates

Existing domestic dwellings, where, for instance, to meet fire safety requirements where loft conversions are made.

Developments of domestic dwellings with limited fire brigade access. Small blocks of flats on 'infill' sites.

Refurbished blocks of high-rise flats

New and refurbished aged persons homes, nursing homes and residential care facilities

Existing HMOs, (Homes of multiple occupation) of which there are over 100,000 of 3 or more storeys, where it has been shown that sprinklers can provide cost beneficial fire protection.

The requirements for properties defined as **residential** are more onerous than for **domestic**, although the basic systems requirements are similar. The main differences are shown below

Definition of system	Design number of sprinklers	Design flow rate L/min	Duration of stored water supply
Domestic	2	84/109*	10 minutes
Residential	4	168/218*	30 minutes

* Design flow depends on whether an automatic priority valve is fitted and will be greater than shown if the approved sprinkler discharge requirement is greater than 42 l/min

2. BS DD 251. Key factors for system design.

Key factors of DD251 include:

1. Consultation with the appropriate water company at initial stage

2. Installation by 'qualified and experienced' contractors
3. Reliable water flow and pressure from mains, or from pump and tanks
4. The installing contractor is responsible for determining the adequacy of water supply at normal 'worst case' time. Because of the greater reliability of mains supply it is preferred to a pump and tank supply. However where the mains are inadequate, or modification of the supply is more costly than provision of a pump and tank, then a pump and tank supply will be preferred.
5. Hydraulic calculation for all installations, with normal maximum design flow rates 84 l/min for domestic and 168 l/min for residential. (Plus an extra 25 or 50 l/min if a priority valve is not fitted).
The pipes, valves and fittings belonging to the customer delivering water to the sprinkler heads will need to be carefully sized to ensure that with the minimum mains pressure used in the design and the pressure losses in the pipe and fittings belonging to the water company there will still be adequate pressure at each sprinkler head at the maximum design flow rates.
6. All systems to be fitted with alarms which operate on water flow, with sounders internally, and lights and sounders externally
7. Copper/CPVC/MDPE pipe normally used. All pipes and fittings to be Water Supply (Water Fittings) Regulations approved
8. No additives to water in pipes for anti-freeze purposes in mains connected systems.
9. Pressure and flow tests required, and the issue of a Certificate of Compliance required on completion.
10. Annual maintenance of each installation, with a flow test of one-minute duration. Anticipated water usage per year per system, for test purposes, 100 litres.

The fire frequency in residential occupancies is about one fire per 350 properties per year, and therefore the overall extra flow in a particular area will be small, particularly since a single operating sprinkler will control most fires. Since the water used by a sprinkler to control a fire is significantly less than likely to be used by the fire brigade on the fire, there should be an overall reduction in the amount of water used. Where extended rural supply systems are being considered to feed sprinkle systems their hydraulic capacity should be considered in relation to normal minimum mains pressures and the additional demand from the proposed system.

DD251 will be revised in the near future, and the water companies are represented through Water UK on the British Standards committee.

3. Interfacing sprinkler systems with the domestic water supply.

The number of systems installed, and accordingly the reduction of the number of fire casualties, will depend to some extent on the cost and ease of obtaining a satisfactory water supply. Mains connections are the preferred option, from the point of view of reliability and continuity of supply. Connections to mains of 3 in diameter or larger, with a service pipe size of minimum 32mm (OD), together with a minimum mains pressure of 3 bar and above should provide an adequate supply for most domestic sprinkler systems. Though the water company will advise on the reliability of the supply and pressure and the connection size required. Storage and boosted systems can be used where the mains pressures are inadequate, or the cost of connection is higher than the storage/boosted supply.

Water supply requirements to meet DD251 needs.

1. Communication with the water company - A **knowledgeable first contact** person/section in each water company.
2. The water company must be notified in writing that a water supply is required at the premises for fire fighting purposes and written approval obtained.
3. Supply of necessary information regarding the local mains supply to enable initial assessments to be made for design and cost purposes. The minimum mains pressure to be used for the design shall be agreed with by the water company. The general minimum sizes of services to sprinkler systems shall be 32mm (OD) for domestic and 50mm (OD) for Residential systems.
4. Connection with mains - Provision of full flow (low pressure loss) connections between mains and service pipes, where economically practical.
5. Allowance of the bypassing of meters where systems are alarmed. Or the provision of a separate, unmetered supply. Needed because of flow restriction by water meters.
6. Permission for the use of pumps to boost the mains supply pressure for domestic installations, up to (say) 200 l/min. To avoid the upgrading of service pipes, but where the mains can adequately provide the flow requirement.
7. Readiness to consider supply requirements for new estates to make provision for sprinklered premises where requested. -

4. Infrastructure Charges

These are charges levied by Water Companies to reflect the additional demand placed upon water resources and treatment capacity by new developments and consequent capital expenditure to fund expansion of these facilities. The levels of charges payable vary from company to company and are determined from time to time in agreement with the Director General of Water Services. The circumstances under which the charges become payable, are defined with Condition C of the License of Appointment relevant to each Water Company.

The basic points are that:

- (a) The charges are payable on the first time connection of any premises not previously supplied with water for domestic purposes by any Water Company or any other body supplying water under any enactment.
- (b) The standard level of charge is payable on any single dwelling house with its own direct supply, not subject to common billing agreement. The size of service pipe to such a dwelling house has no bearing on the level of charge due.
- (c) For premises including a house on a shared supply and subject to a common billing agreement or any commercial premises with a supply size larger than that normally provided to a dwelling house, the charge is based around a demand calculation and comparison to a standard dwelling. This determines a multiplication factor by which the standard charge is raised to reflect the level of demand.
- (d) Only points of use where water is used for domestic purposes are included and appropriate with regards to any calculation of Infrastructure Charges. No charge is therefore able to be levied in respect of supplies for sprinkler or other fire fighting purposes.
- (e) The Infrastructure Charges (where appropriate) should be paid simultaneously with any charge for the connection of a new service and the new service and consequent connection for any sprinkler system may not be provided until both charges have been paid.

5. Types of Systems

There are two types of systems that will be addressed within this guidance document:

(a) Domestic Systems,

Domestic systems will be regarded as providing cover within a single dwelling house. They will be self contained systems with a unique feed to an alarm valve set and will supply water to no more than two sprinkler heads operating simultaneously.

(b) Residential Systems

Residential Systems will be regarded as providing cover to premises providing accommodation for multiple individuals or families. These will be premises such as Hostels, Nursing Homes, Houses in Multiple Occupation, flats etc. The systems will provide a supply to cover the operation of no more than four heads operating simultaneously.

The water supply requirements for each type of system therefore varies as a function of the number of sprinkler heads potentially requiring simultaneous supply in the event of a fire.

Applications to Water Companies shall clearly indicate whether a domestic or residential system is required and the flow required.

6. Preferred Routes of Contact With Water Companies

It has been agreed that that the primary route into Water Companies for applications and communications regarding residential and domestic sprinkler systems shall be via the Water Regulations sections. It is understood that these departments may not always be the appropriate one to deal with the enquiry but they will forward details on to the correct parts of the companies.

A list of nominated contacts is included in Appendix 1. *(Not included at this stage)*

7. Sprinkler Systems in Metered Premises

There are various risks and issues that Water Companies need to take into account when balancing the legitimate life safety interest, systems design and performance issues and among others, the risk of fraudulent taking of supplies.

The primary consideration has to be the life safety protection provided by a correctly functioning, reliable sprinkler system and other considerations should be accommodated where practical.

In negotiating how systems will be fed, all efforts should be made to agree upon system design arrangements that provide the best system reliability and economic installation. Where mains pressures and flows are sufficient this will be best provided by a direct mains connection. This obviously avoids reliance upon electrical and mechanical components that may be called upon to perform many years after installation with only brief annual tests. It is only through this route that the benefits of domestic and residential sprinklers will reach their full potential.

Scope of Metering.

Properties that are normally metered are:

- (a) new built houses in England and Wales and those built since the late 1980's,
- (b) commercial premises with a supply of water for domestic purposes, e.g. nursing homes;
- (c) those premises with a supply of water for non-domestic purposes or likely by virtue of equipment installed to use more than is reasonable for domestic purposes;
- (d) those household customers who have opted to be supplied by meter;

- (e) dwelling houses extended beyond the scope of the original rateable value against which the charges would be assessed.

Difficulties With Metered Services to Sprinkler Systems

The use of meters on sprinkler supplies has several potential drawbacks:

- (a) Hydraulic losses through water meters sized for normal household demand would be significant at sprinkler system design flow rates and would seriously impede the performance of a sprinkler system.
- (b) Meters that are positive displacement types with moving pistons or chambers are susceptible to blockages or obstructions that may either result in excessive hydraulic restriction or complete blockage that would render a sprinkler system ineffective in the event of a fire.
- (c) There are few types of meter that may be able to deal with these issues above and then they would not be economically viable or may not have the appropriate authorisation for use by Trading Standards in the UK for households.

Metered/Storage Fed Systems

The only feasible way therefore in which supplies for sprinkler systems can be provided via a domestic meter is when the supply is taken via a storage cistern within the premises. This means that only the refill rate of flow has to be able to be measured. However if this system is adopted across the board, it would restrict the general availability of mains pressure fed sprinkler systems. The Water Companies recognise that this may affect both the economic viability of sprinkler installations and provide perhaps a less reliable system as additional mechanical and electrical components are introduced and therefore should where possible be avoided.

Information to Occupiers

It is anticipated that in all cases of sprinkler installations, the installer will fully brief the occupier of their responsibilities regarding maintenance and testing of the system. Including the importance of not tampering or interfering with the system and in the case of provided housing or registered premises the potential offence of, and consequences from interfering with a life safety system.

Charging Evasion.

Experience indicates that there will be a small number of customers who will attempt to evade normal charging arrangements when they are supplied via a meter. This normally involves use of supplies within or around their premises that are not metered, or interference with the normal operation of the meter. Un-metered sprinkler services within premises could offer such an opportunity to make connections to un-measured pipework. It is recognised that the correct installation, maintenance and testing of alarm switches on sprinkler systems will limit the risk of taking of water from unmeasured supplies. However given the normal system valve layouts this is by no means a guaranteed measure against such fraud. An appropriately sized check meter (separate to the domestic meter) on the branch to the sprinkler system could be installed to provide an indicator of any unauthorised use of water via the sprinkler system although this still carries the slight risk of blockage in the event of system operation.

Conclusion.

Until there is wider experience of the behaviour of customers with un-metered sprinkler systems with regards to potential fraud, direct mains fed systems will be generally acceptable to the Water Companies.

8. Water Company Obligations

Water Companies should facilitate the installation of sprinkler systems by:

- (a) Responding to enquiries regarding mains pressure as soon as practical, by using appropriate readily available information sources e.g. computer network models, pressure logger data, pressure readings adjacent to site etc. Any significant seasonal variations in pressure should be explained and also costs of alternative sources of this information.

- (b) Seeking to provide lowest installed cost of water services by exploring with the applicant the alternative means of servicing the required demand e.g. use of existing services, appropriate size and route of new services.
- (c) Responding to applications with quotations and supporting information within statutory and regulatory time periods.
- (d) Providing new services and/or associated works with statutory timescales after payment of required charges and evidence of Water (Fittings) Regulations compliance has been confirmed.

9. Mains Pressures and Flows

Water Companies have no statutory obligation and consequently are not directly funded, to maintain any levels of pressure or flow within water distribution systems that would necessarily be sufficient to correctly operate any direct mains fed sprinkler system. It is accepted however that where mains pressures and capacities are sufficient to operate such systems then they may be fed direct, rather than via storage. Where direct mains fed systems are installed then this shall be subject to the agreement that they shall be subject to regular inspection and testing as required by the standard DD251. Then any potential operating deficiency due to changes in the water supply characteristics becomes the responsibility of the property owner to resolve and if necessary provide additional measures to ensure the satisfactory operation of the system.

10. Installers Obligations

Installers, in order to assist the smooth progression of installations should:

- (a) Make contact with the local water company as early as practical to seek information on mains pressures. Note: in existing premises it may expedite matters for installers/designers to utilise their own pressure gauges to measure pressure at a tap within the premises.
- (b) Provide full information regarding the proposed system and its water supply requirements on an Application For Water Supply form. This should include:
 - (i) if both domestic and sprinkler requirements are to be supplied via a new service,
 - (ii) which class of system is proposed i.e. Domestic or Residential,
 - (iii) what level of flow is required for the system and a statement that the system will be in accordance with a current standard e.g. DD251/BS 5306.
- (c) Provide notification under Water (Fittings) Regulations where this is required (see Section 11)
- (d) Install systems in accordance with Water (Fittings) Regulations and relevant standards.

11. The Water Supply (Water Fittings) Regulations 1999

What are they and how do they effect sprinkler installations?

What are the Regulations?

The Water Supply (Water Fittings) Regulations 1999 are National requirements for the design, materials, installation and maintenance of plumbing systems, water fittings and appliances. Their purpose is to prevent waste, misuse, undue consumption and above all the contamination of water supplies.

Where do they apply?

They apply to all plumbing systems, fittings and equipment in all types of premises supplied with water by the statutory water suppliers in England and Wales. The Regulations apply from the point where the service pipe enters the premises. This is usually at the boundary with the street in which the water main serving the premises is laid.

Who has to comply?

Owners and occupiers of premises and anyone who installs a plumbing system have a legal duty to ensure that the installation satisfies the requirements of the Regulations. In many situation advance notice of the proposed installation must be given to the relevant water supplier by the installer. System designers and installers' have to follow the requirements of the Regulations on behalf of future owners/users.

Enforcement

The water supply companies are responsible to the Government for the enforcement of the Regulations.

In situations where the risk of contamination is imminent the response of the water supplier may result in disconnection of the water supply.

It is a criminal offence to breach the 'Water Regulations' and offenders reluctant to co-operate with the statutory requirements may face prosecution.

How do the Regulations effect sprinkler installations?

Notification

All sprinkler installations in new premises or alterations to sprinkler systems in existing premises, other than houses, should be notified to the water supplier. This requirement also applies where a pump is to be installed in any installation, including a house¹.

Notification must include:

- The name and address of the person giving the notice, and if different, the name and address of the person to whom consent should be given.;
- a description of the proposed work;
- the location of the premises to which the proposal relates, and the use or intended use of those premises;
- a plan of those parts of the premises to which the proposal relates;
- a diagram showing the pipework and fitting to be installed; and
- Where the work is to be carried out by an approved contractor, the name of the contractor.

Installation work should not commence without the consent of the water undertaker. Consent may be subject conditions but it should not be withheld unreasonably. Consent shall be deemed to have been granted if no notice is given by the water undertaker within 10

¹ Refer to Regulation 5 in Water Supply (Water Fittings) Regulations 1999 for full list of requirements

working days, but this does not alter the obligation of the installer to comply with the regulatory requirements.

An approved contractor is a contractor approved by the water supplier who is able, by virtue of a recognised qualification, to furnish a signed certificate confirming the installation complies with the requirements of the Regulations.

Fittings, Materials and Workmanship

The Regulations set standards for water fittings, materials and the way they are installed, often referring to recognised British or European Standards. The following is Regulation 4 as published.

Requirements for water fittings etc.

1. (1) Every water fitting shall-
 - (a) be of an appropriate quality and standard; and
 - (b) be suitable for the circumstances in which it is used.
- (2) For the purposes of this regulation, a water fitting is of an appropriate quality or standard only if-
 - (a) it bears an appropriate CE marking in accordance with the Directive;
 - (b) it conforms to an appropriate harmonised standard or European technical approval;
 - (c) it conforms to an appropriate British Standard or some other national specification of an EEA State which provides an equivalent level of protection and performance; or
 - (d) it conforms to a specification approved by the regulator.
- (3) Every water fitting shall comply with the requirements of Schedule 2 to these Regulations as it applies to that fitting.
- (4) Where any requirement of Schedule 2 relates to a water system, every water fitting which forms part of that system shall be fitted or, as the case may be, altered or replaced so as to comply with that requirement.
- (5) Every water fitting shall be installed, connected, altered, repaired or disconnected in a workmanlike manner.
- (6) For the purposes of this regulation, a water fitting is installed, connected, altered, repaired or disconnected in a workmanlike manner only if the work is carried out so as to conform-
 - (a) to an appropriate British Standard, a European technical approval or some other national specification of an EEA State which provides an equivalent level of protection and performance;
 - (b) to a specification approved by the regulator; or
 - (c) to a method of installation approved by the water undertaker.

Prevention of contamination (Backflow Protection)

Where water supplied by the water undertaker is in contact fluids, substances or materials that could contaminate it, there must be adequate protection in place to prevent the backflow or backsiphonage of contaminants into the water supply. Schedule 1 of the Regulations defines fluid risk categories according to the type and concentration of the contaminant likely to be present. Section 6 of Schedule 2 specifies the level and type of backflow prevention device required in each situation.

General

Other relevant requirements include the marking of pipes according to their purpose and the fluid they carry, frost protection (insulation) and pipework support.

Brief summary

- Sprinkler systems, and alterations to them, must be installed and maintained to comply with the requirements of the Water Supply (Water Fittings) Regulations 1999.
- Advance notification to the water undertaker will be required for installations in all premises other than single dwelling houses where a pump is **not** being installed.
- The installation and all fittings used must meet regulatory requirements.
- Appropriate backflow protection systems / devices must be installed to protect wholesome water supplies from contamination.

Water Company Obligation to Supply

This is generally covered in Sections 55 to 57 of the Water Industry Act 1991 which sets out the requirements for the supply of water for non domestic and fire fighting supplies. ***These Sections should not be read in isolation.***

It is essential that installers liaise fully with water suppliers and take full account of local conditions when designing sprinkler systems.

In brief:

It is the installer's/designer's responsibility to ensure that sufficient pressure and flow is available before proceeding with the installation of a particular fitting or appliance.

The installer/designer should always ensure that the fitting or appliance is capable of withstanding the pressure it is likely to be subject to. The Water Undertaker will advise on the pressure available in the distribution system at the point of supply. A charge may be levied by the Water Undertaker where flow & pressure test are required.

The installer/designer should always ensure that there is sufficient flow to satisfy the demand of all fittings and appliances initially and later should the system be extended.

12. Supply Arrangements

There are several means by which adequate water supplies can be provided to domestic and residential sprinkler systems.

(a) Direct Mains Fed Systems

These are systems where mains pressure and service pipe flow delivery is adequate to feed the sprinkler operating requirements directly. A service pipe to the sprinkler system and possibly to other elements of water demand within the premises will be provided. The use of a priority demand valve fitted within the premises may be made on such systems. This is to ensure that in the event of operation of the sprinkler system, the branch from the pipework

system feeding the domestic demand will be automatically shut down, thus ensuring that all available pressure and flow will be directed to the sprinkler heads.

(b) Mains Fed Boosted Systems.

This type of system feed could be utilised where the mains and the service pipe can deliver adequate flow to meet sprinkler system requirements, but there may be inadequate pressure to meet the sprinkler system requirements. In this instance the Water Company will consider giving permission for an in-line booster pump of an appropriate rating to be installed on the service pipe feeding the sprinkler system, if the following provisions are met:

- (i) Notification as required under the Water Regulations is provided to the Water Company.
- (ii) The proposed pump shall be appropriately sized to ensure its adequate performance.
- (iii) There is a pressure gauge installed on the suction side of the pump that can monitor pressure during tests.
- (iv) That during full-flow test conditions the pressure in the service pipe at or near the pump inlet does not drop below atmospheric.
- (v) The pump is triggered solely by flow within the sprinkler pipework system or at individual heads. It must not support any element of domestic demand or other non-domestic usage of water within the premises.
- (vi) There should be a non-return valve installed on the domestic branch to prevent air being drawn into the pump inlet from a domestic outlet e.g. an open tap of float operated valve, which would render the pump ineffective.

(c) Storage and Boosted Systems

This type of system relies upon a volume of stored water to meet the demands created by the sprinkler system operation as determined by the relevant standards and may be supplemented by an infill rate from the float operated valve which controls the level of water in the cistern. All feeds to such cisterns shall have appropriate backflow protection relative to a “fluid 5 risk category. A pipe feeding out from the cistern would lead through a booster pump rated to meet pressure and flow requirements of the sprinkler system. This system has the advantage that the size of service pipe feeding the premises need not be larger than current standard size to meet domestic demand. This type of arrangement has the disadvantage that adequate space and structural strength is required to house the stored water if it is inside the property.

This arrangement may be particularly useful in the following circumstances:

- (i) Installation of a sprinkler system into existing premises with an inadequate service pipe size to deliver system design flows, thus avoiding the cost and practical difficulties of replacing the service pipe with one of an adequate size.
- (ii) Installation of a sprinkler system into premises with a measured supply where there is an established risk of illegal use of water.
- (iii) It should be noted that in relatively rare situations, where premises are served from a service reservoir and the level within the premises to which water is required to be supplied is within 10.5metres of the outlet level of the reservoir, then any supply apart from a single drinking water tap must be supplied from a storage cistern since the supply can be expected to be of a low flow and pressure and possibly even be intermittent. This is a rare occurrence and would theoretically apply to any sprinkler system feed in affected premises. It would apply by default because with such a low level of available mains pressure it is unlikely that even an adequate flow and mains pressure would be able to be obtained

13. Service Pipe Design

Hydraulic Design

Service pipe hydraulic design to premises where sprinkler systems are proposed for installation should take into account the following factors:

- (a) Lowest mains pressure to be experienced in the vicinity at times of peak demand
- (b) Design flows for the sprinkler system as provided by the system designer, established standards or component requirements.
- (c) The elevation of the highest sprinkler head relative to the mains elevation.
- (d) The total length of service pipe to reach the sprinkler stop valve location.
- (e) An allowance for pressure losses through components included in the service pipe
- (f) Design pressure for acceptable sprinkler head performance.
- (g) The pipe will need to be carefully sized to help ensure that there will be adequate pressure (approx 0.5Bar) at each sprinkler head at the flow rates and minimum mains pressure used in the design. If the minimum pressure at each sprinkler head cannot be achieved then a storage and/or boosted system will be necessary which will probably allow smaller service and supply pipes.

This design will determine firstly if a direct mains pressure fed system is feasible.

Secondly, if boosting is proposed the water company service pipe can be hydraulically sized to provide the flow requirement and an optimum level of pressure that the booster pump would provide.

Thirdly, if a mains pressure system is viable the appropriate communication pipe size to deliver the design flow and pressure to the supply pipe, after which point the hydraulic design of the system supply pipework and components is the responsibility of the design engineer.

Physical Design

The service pipe performance is not solely a matter of pipe material type internal diameter and length. The components included in the line of the service pipe can have a significant effect up on the hydraulic design/performance. Such components that should receive consideration in their selection and use within service to sprinkler systems are:

- (a) Ferrule connectors - These are used to make a connection to a main, usually under pressure and may be installed as a standalone item or in conjunction with other specialised equipment. Some types/ sizes and designs of ferrules have significant restrictions in the waterways and may not be suitable to deliver the flows required for mains pressure systems. The type of ferrule with the least hydraulic restriction that should be used on all connections to polyethylene mains is the electrofusion tapping saddle. Self cutting saddles usually manufactured from gunmetal for connections to PVC, PE and A.C. mains with swivel outlets often have limited waterway which will result in unacceptable pressure losses at system design flows. Connection sizes up to 25mm internal diameter into 80mm diameter mains (or larger) are readily achievable under mains pressure. However this may not always be suitable for sprinkler system flow rates. If a larger diameter connection is required then these are achievable via specialist under pressure tees, tapping saddles or tees cut into the main but these will result in significantly higher costs for the work.
- (b) Stop valves - Traditional stop taps have rather convoluted waterways as a consequence of their seat design. Other types of full bore control valve are available in the form of spherical plug valves and diaphragm valves, but such valves should be operated with care as surge can be caused by rapid closure. All such components to be installed in apparatus fed with mains water must be Water (Fittings) Regulations compliant.
- (c) Check valves, (backflow preventers) These need to be installed in the service pipe to prevent stagnant water in the sprinkler system mixing with the potable (fluid category

1) water by a reversal of flow, their effect upon the overall hydraulic losses can be determined. These devices contain spring loaded valves which seat at zero flow, and therefore require energy to overcome the spring pressure and maintain the valve in an open position during flow. This energy translates into pressure loss and should be allowed for.

Physical Layout

The arrangement of service pipe provision is to meet several factors,

- (a) Delivery of appropriate pressure and flow.
- (b) Minimise over-capacity for domestic demand and lack of turn over of water.
- (c) Simplification of service pipe layout.
- (d) Facilitate metering of non-sprinkler usage where required.

New Domestic Premises

Where sprinkler systems are specified at the time of design/construction of new dwelling houses then the service pipe should be provided via a single point of connection from the new or existing main. The water company service pipe should be laid to the boundary of the street in which the main is laid at a diameter suitable for the sprinkler system requirements and available pressures. Just within the street or the land adjacent, the water company service pipe should branch to form a pipe to serve the domestic demand and one to feed the sprinkler system. The branch to feed the domestic demand should be stop tap controlled and metered at whatever location the local Water Company policy states. The branch to the sprinkler system should have a stop valve and a single backflow preventer installed in a chamber to leave these accessible for future operation, testing, maintenance and replacement. The two service pipes owned and maintained by the customer should then continue to the points where they enter the dwelling. **Figures 1A & 1B**

If in-line boosting is deemed necessary and agreed, then the booster pump should be installed just upstream of the sprinkler stop valve.

If a storage and boosted system is to be installed then standard sized service pipes and metering arrangement will be provided with a branch off the supply pipe feeding to the storage cistern (with appropriate backflow protection). **Figure 2.**

Contaminated Land

Where developments are situated upon, or new services are provided though, ground which is or is liable to be, contaminated with hydrocarbon compounds which might permeate PE pipe and contaminate/taint potable water. Then appropriate metallic or barrier pipe shall be utilised to protect the water supply. The water company must be notified of this risk of contamination along with any soil test reports and they will advise what materials and protection measures need to be incorporated.

New Residential Premises

Where sprinkler systems are proposed at the time of design/construction then it is likely that there will be less difference between the rates of flow for the domestic demand and that for the sprinkler system than in dwelling houses. If this is the case and the domestic demand will ensure reasonable turnover in a dual purpose service pipe, then consideration should be given to the service pipe serving both requirements.

Internally sited meter .Figure 3

The service pipe should branch to become domestic and sprinkler feeds with the meter installed on the domestic leg. The meter for the premises should be able to be sited at the point where the incoming service rises and branches, if reasonable access to that point is available for meter reading. The sprinkler stop valve should be installed immediately downstream of the branch. In this type of installation a priority demand valve should be installed on the domestic branch to terminate demand in the case of a fire.

Externally Sited Meter. Figure 4

If an external meter location is deemed necessary then the service pipe should branch within the meter chamber with stop valves and backflow prevention as described above for a new dwelling.

Existing Dwellings

Houses

It is unlikely that many existing service pipes installed to a single dwelling will be of an adequate hydraulic capacity to directly operate a sprinkler system. The choice therefore has to be made between a storage and boosted system (**figure 5**) utilising the existing service pipe, and the provision of a new connection to the main and communication pipe for the sprinkler system. The water company may decide to also connect the existing domestic supply pipe to this. Whether the property is metered or likely to be metered will dictate the service pipe format as for a new dwelling (**figure 1**) or a single service to the point of entry where it would branch to service sprinkler and domestic demands (**figure 6**).

Flats

With flats and the leasehold nature of their ownership plus management arrangements, it is unlikely that single flats might be sprinklered. If the service to the flats is provided via a single communication pipe then it is possible that this may be of an adequate capacity to feed a sprinkler system with a priority demand valve. If this is possible then the new feed for the sprinkler system could be connected upstream of the meter location unless the meter is of an inferential (large capacity rotary vane) type when connection downstream may be possible. The remainder of the domestic service should have a priority demand valve fitted downstream of the branch to the sprinkler system.

Residential Premises.

Existing Residential Premises should be surveyed to determine if the existing service pipe is of an adequate size in relation to the mains pressure to feed a sprinkler system. If it is adequate and the meter can be located in a position satisfactory for reading access then the branch for the sprinkler system can be taken off the incoming service and the meter (re)located on the branch to the domestic supply (**figure 7**). If the size of the existing service pipe is not adequate to deliver the necessary flows then a new service pipe should be installed to feed the system.

APPENDIX 1 – Glossary of Terms

Water Main: Pipe belonging to the Water Undertaker (Water Company) installed with the purpose of providing a general supply of water.

Service Pipe: The branch from a water main to the first internal stop valve intended to provide a supply of water to a specific customer or group of customers.

Communication Pipe: The section of service pipe owned and maintained by the Water Undertaker.

Supply Pipe: The Section of service pipe owned and maintained by the customer.

Cistern: Water Storage vessel with a water surface exposed to atmospheric pressure.

Pump and Tank Supply: Supply of water from a storage cistern via a booster pump to ensure adequate pressure and flow to meet sprinkler system requirements.

Sprinkler Head: The outlet fitting from which water is discharged in a spray pattern to control fires.

Sprinkler System: The assembly of pipes fittings and valves to distribute water under pressure to sprinkler heads.

Check Meter: Meter installed by the Water Company to monitor potential illegal usage, no standing or volumetric charge is made unless there is usage for purposes other than fire related.

Priority Demand Valve: Device, automatically operated by control system to isolate the flow to the domestic system in the event of a fire, thus ensuring all available pressure and flow is directed to the sprinkler system.

Stop Valve: Device to isolate the supply of water. Also referred to as a “stop tap.”

Check Valve: Device to ensure that water only flows in the single intended direction in a pipe.

Backflow Preventer: Check valve that will seat at zero flow.

Backflow Prevention: Arrangement of pipe and fittings designed to prevent reverse flow and backsiphonage of potential contaminants into the water supply.

Downstream: In the direction of normal flow of the water in a pipe.

Upstream: In the direction opposite to the normal flow of water flow in a pipe.

Domestic Supply: Supply to points of demand within premises using water for domestic purposes, i.e. drinking, cooking, washing, bathing, sanitary purposes, central heating, food preparation. For a full definition refer to Water Industry Act 1991 Section 218.

Fluid Category: This is a numerical value to represent the risk to human health of a fluid that may be present inside or outside pipework.

Appendix 2 – Water Company Contacts