

Sprinkler systems in housing in Wales

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Introduction

- Installation of fire sprinklers monitoring project
- Commissioned by Welsh Government
- Specified research relating to detailed monitoring of pilot schemes, concerning design and installation of fire sprinkler systems in housing in Wales
- Two year project June 2014 to June 2016
- Interim report was published December 2015
- Final report to be delivered to Welsh Government end June 2016

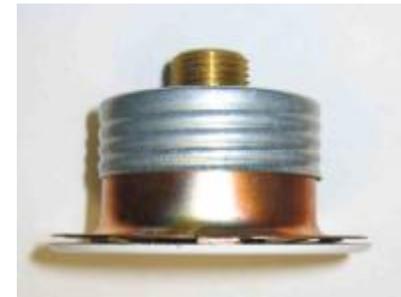
Principles of automatic residential sprinkler systems

- Designed to
 - Detect fire, operate and provide water to suppress and control the fire and in some cases extinguish it
 - Also, wet surrounding combustible materials so they do not ignite
 - Wet surfaces at high level to cool building structure
 - Cool smoky gases and reduce likelihood of flashover
- Primarily to protect life
- Installed as part of overall package of fire safety measures e.g. fire detection and alarm systems and passive fire protection



Previous BRE experimental research on residential sprinklers for UK Government

- Effectiveness of sprinklers in residential premises, BRE project report 204505, 2004
www.bre.co.uk/page.jsp?id=422
- Effectiveness of sprinklers in residential premises – the evaluation of concealed and recessed pattern sprinkler products, BRE project report 218113, 2006
www.bre.co.uk/page.jsp?id=723
- Sprinkler Effectiveness in Care Homes, BD 2546, 2007
www.communities.gov.uk/documents/planningandbuilding/pdf/sprinkler-effectiveness.pdf
- Residential sprinkler installation practice to maximise functionality and to prevent possible fire penetration, BD 2551, 2009
www.communities.gov.uk/publications/planningandbuilding/residentialsprinklerinstallation



Background

- In October 2013, National Assembly for Wales passed regulations that introduced a new requirement into the Building (Wales) Regulations 2010 for the installation of automatic fire suppression systems in certain dwellings



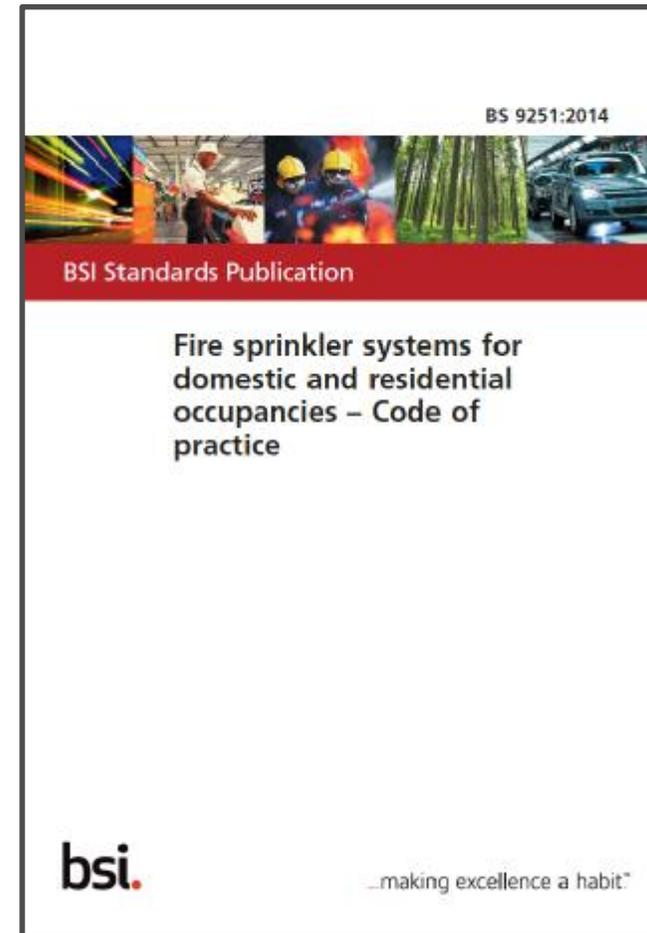
Background

- New requirement was introduced in two stages
 - From 30 April 2014 for **new and converted care homes** (as defined in the Care Standards Act 2000), **children’s residential homes, halls of residence, boarding houses and hostels other than hostels intended for temporary accommodation for leisure purposes**
 - From 1 January 2016 for **new and converted houses and flats**



Background – current standards

- BS 9251:2014, 'Fire sprinkler systems for domestic and residential occupancies – Code of Practice'
 - Gives recommendations for design, installation, components, water supplies, commissioning, maintenance, testing
- AD B (Wales) refers to BS 9251 as main standard by which regulatory requirement can be met for domestic and residential occupancies
- Where fall outside BS 9251 scope, relevant standard is BS EN 12845 'Fixed firefighting systems - Automatic sprinkler systems - Design, installation and maintenance'



Background

- In preparation for introduction of new requirement for fire sprinklers for new and converted houses and flats from 1st January 2016, Welsh Minister for Housing and Regeneration agreed to run a series of pilot projects, funding the cost of designing and installing fire sprinkler systems in social housing in Wales, for participating housing associations/Registered Social Landlords
- In addition to Social Housing Grant funded schemes, there are two non-funded schemes and one scheme from a major house builder

Overall aim of project

- To systematically monitor and record the learning and experience relating to issues, solutions to issues and the process concerning the design and installation of a fire sprinkler system in social housing
- including the issues and solutions concerning water supply, the negotiation process with the relevant water company, the application of guidance in the Approved Documents B (Wales)
- To identify design and installation costs

Issues to be monitored

- *Pre installation*
 - Areas of compliance that have been difficult to achieve in design
 - Regulatory requirements and compliance, input from Building Control Body, designer and water company
- *During installation*
 - Compliance issues
 - Contractor, sprinkler installer issues
 - Site issues
 - Availability of material issues
 - Installation, design issues that have changed from the initial design due to site issues
- *Post installation*
 - Commissioning of system issues
 - Future maintenance issues



Tasks

Task 1 – Scoping out an overall monitoring strategy and methodology

Provided details of what information and data to collect and from whom, and how to collect information and data

Task 2 – Pre-installation monitoring and review

Task 3 – Monitoring and review during installation

Task 4 – Monitoring and review post installation

Task 5 – Reporting and presentation

Task 6 – Project Steering Group activities

Key part of project

Monitoring Tasks

- Carried out in a cycle for each building covering three stages:
 - Pre-installation, During installation, Post installation of sprinklers
- First approach in capturing data and views initially to contact relevant housing association or private developer
- Housing associations provided building information, contact information and cost estimates
- Process cascaded to other stakeholders: sprinkler designer/installer, architect/designer, house builder, building control practitioner and water company representative
- Key questions posed to each stakeholder to obtain relevant information/data/views and response recorded

Site visits

- One site visit carried out for each development during sprinkler installation
- Face to face interviews
- Information/views gathered, primarily from sprinkler system installer and building site manager but also from housing association representatives and others, if present
- Photographs taken of sprinkler system installation in progress
- Selected further site visits carried out post-installation



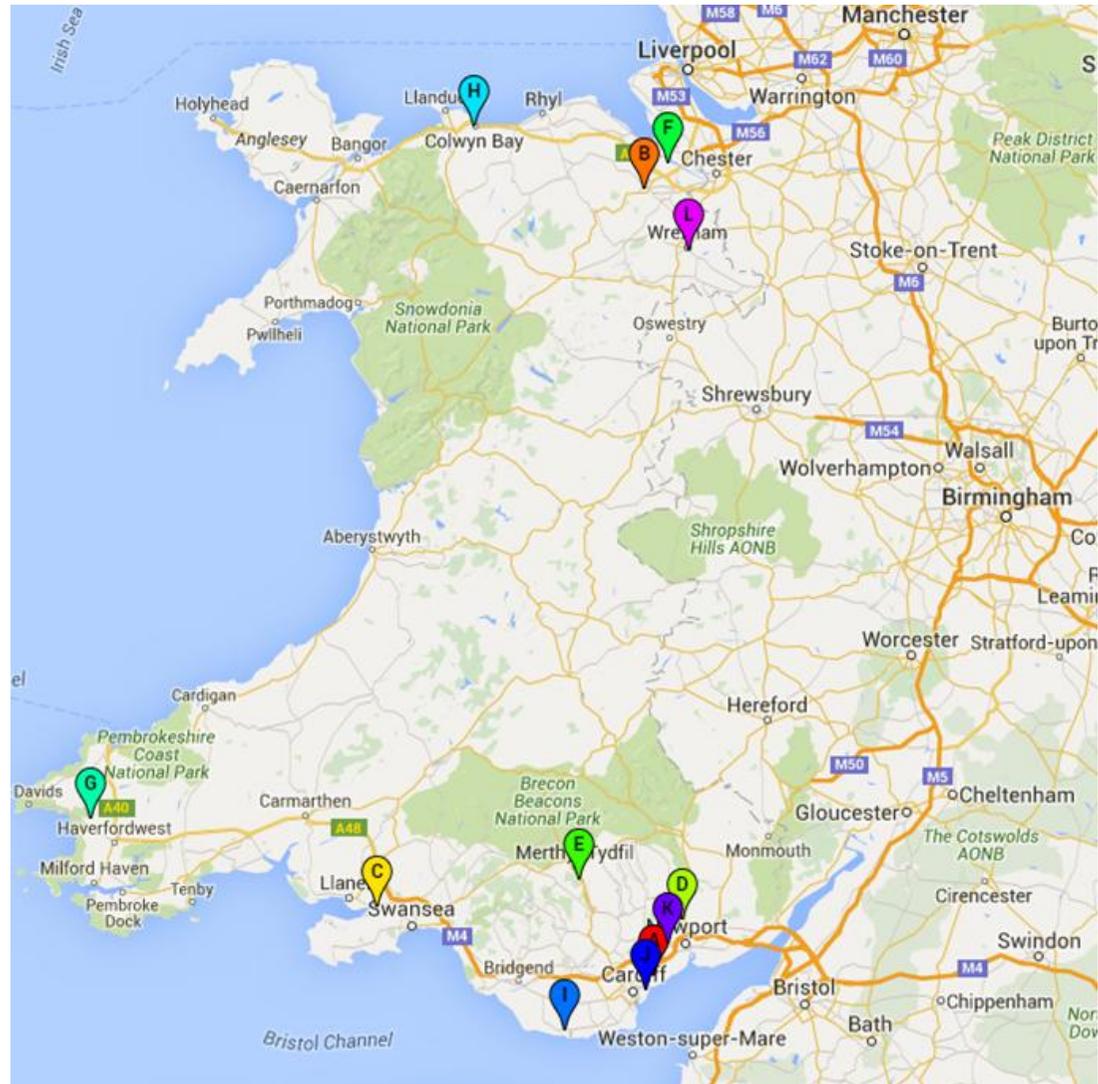
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Site visit



Pilot schemes

- 12 schemes
- 4 schemes north Wales
- 8 schemes south Wales
- None mid Wales



Map data ©2016 Google

Details of pilot schemes

Geographical location	Water company area	Small scale development (<10 units)	Medium scale development (10-30 units)	Large scale development (30+ units)
North Wales	Dwr Cymru Welsh Water	6, 12, 14	0	0
North Wales	Dee Valley Water	0	19	0
Mid Wales	Severn Trent Water	0	0	0
Mid Wales	Dwr Cymru Welsh Water	0	0	0
South Wales	Dwr Cymru Welsh Water	7, 18	1, 9, 11, 13, 15	17
Total number of units	= 177	28 units	111 units	38 units

- Most part of medium scale developments
- Pilot schemes involves a total of 177 housing units
- Five small-scale (less than 10 units), six medium scale (10 to 30 units) and one large scale development (30+ units) containing 38 units

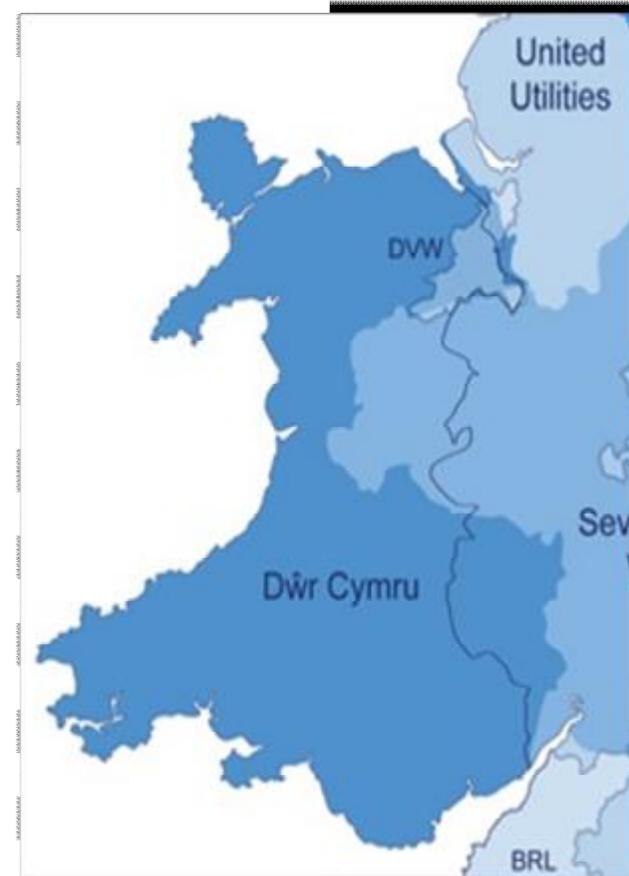
Building information

- Eleven schemes are new build and one scheme is a conversion (of an old school)
- Developments include bungalows, houses, walk up flats with separate entrances and flats with communal entrances
- Schemes cover masonry, steel frame and timber frame construction
- Building unit areas and building height and storey heights collected
- Occupants of buildings to be people with unknown, general or different types of special needs



Water companies for Wales

- Three different water companies serve Wales
- **Dwr Cymru Welsh Water** covers most of Wales
- **Dee Valley Water**, part of north Wales mainly Wrexham
- **Severn Trent Water**, part of mid-Wales
- 11 schemes Dwr Cymru Welsh Water, 1 scheme Dee Valley Water, none for Severn Trent Water



Water supplies

- Important that sprinkler system water supplies are reliable and provide sufficient flow and pressure to satisfy system design requirements
- Different types of water supplies:
 - Direct town mains connection
 - Direct mains connection with a booster pump (booster pump can increase pressure but not flow)
 - Storage tank and pump
- Water supply to property can be a dedicated sprinkler supply (separate to the domestic water supply) or combined domestic water and sprinkler supply

Examples - Sprinkler factors affecting the building design pre-installation

- Voids to accommodate sprinkler pipe need to be designed to be of sufficient size.
- Open web floor joists have been specified in timber frame constructions which can readily accommodate sprinkler pipe.
- Location, space and structure requirements of any tank and the location and space for any pump(s) and control valve arrangements need to be planned.
- Problem in one scheme in siting sprinkler system manifold in unit under kitchen sink with domestic plumbing because of insufficient space.



Examples - Sprinkler factors affecting the building design pre-installation

- In two schemes a booster pump unit has been located inside a kitchen cupboard which then reduces storage space and is unsightly. The two housing associations indicated that they would use different location in future.
- Location and audibility of sprinkler sounders seems to be a grey area. In one scheme internal sounder located inside a cupboard under stairs in each house.
- Frost prevention measures (trace heating, lagging or nothing) seems to be another grey area.



Sprinkler contractors

- Sprinkler design and installer companies are third party approved and members of relevant sprinkler trade association



Example - Contractor and sprinkler installer issues during installation

- Sprinkler installation treated by site managers as additional installation stage/additional stages on site; sprinkler first fix has been first, or after plumbers and before electrical contractors, or last (for bungalows)
- In one case all contractors were working at same time but allocated areas for pipe runs



Example - Changes from initial design due to site issues during installation

- Block of six, two-storey walk up flats
- The sprinkler manifold was intended to be located with the domestic plumbing under the kitchen sink unit.
- For an as yet unknown reason, on site the sprinkler water supply pipe is located in the corner of the room
- This means that the manifold will need to be mounted on the wall, the pipework boxed in and an access 'door' fitted.



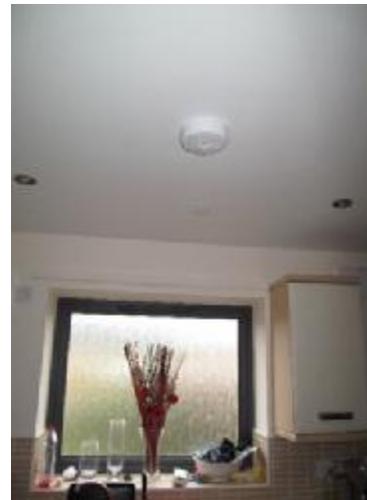
Example – availability of material issues during installation

- There have been no issues to date with supply of residential sprinkler system components
- All of the schemes have employed orange fire-rated CPVC plastic pipe with one exception
- Several suppliers models of concealed residential sprinkler heads have been installed



Example - Future maintenance issue post installation

- Regular maintenance of the system is important
- In this block of flats, key components of the sprinkler system could be accessed from outside each flat and be kept secure



Example - Water supplies for 5-storey block of flats

- Reported that there were no issues with water supplies for 5-storey block of flats
- Feedback received is that although there were initial concerns, scheme went smoothly, attributed to water supplies being decided early and dealings with water company were straightforward



Example – Water supplies for 5-storey block of flats

- Combined water supplies for domestic water and sprinkler systems provided using pumps and tank
- Residential sprinkler systems have been connected to water supplies, commissioned and individual third party Certificates of Conformity to BS 9251 issued for each flat
- At commissioning, water flow rates found to be much higher than minimum required for design



Example – Water supplies for another scheme

- Scheme of two storey semi-detached houses, one three-storey block of flats and six, two-storey block of walk up flats
- Originally proposed dedicated sprinkler mains supply with one inline pump
- Flow test after the 32mm mains supply was provided showed the water flow rate to be insufficient
- Final solution was communal booster pump and cylindrical tank for the whole scheme
- Pump room sized in case tank needed and located to rear of three-storey block



Examples of sprinkler system costs

Case	Cost of design and installation	Water company charges	Cost of water supplies	Total cost per accommodation unit	Exclusions
A 4 flats in 2-storey block	£1,991 per flat BS 9251: 2014 Category 1 individual flat	£0	£1,550 per booster pump, one per flat	£3,541 per flat	VAT and electrical and builder's work
B 20 flats in 5-storey block	£1,440 per flat BS 9251: 2005 Domestic - flats only not common parts	£0 combined water supply for domestic and sprinklers	£0 Pumps and tank for domestic and sprinkler system	£1,440 per flat	VAT and electrical and builder's work
C 3 bedroom 2-storey house	£1,620 per 2-storey house BS 9251: 2014 Category 1 house	None	£0 Mains fed or 1 booster pump To be confirmed	£1,620 per house if mains fed (£3,170 per house with booster pump)	VAT and electrical and builder's work
D 4 bedroom 2-storey house	£1,810 per 2-storey house BS 9251: 2014 Category 1 house	None	Mains fed or 1 booster pump To be confirmed	£1,810 per house if mains fed £3,360 per house with booster pump	VAT and electrical and builder's work

Interim conclusions (1)

- There have been a number of learning experiences for all stakeholders involved including sprinkler contractors
- Some stakeholders have not had experience or knowledge about residential sprinkler systems prior to these projects; a few have good specialist knowledge
- It is helpful if specialist sprinkler input is sought and provided in the early design stages so that sprinkler factors affecting the building design or having impact on other building services, and vice versa, are taken into account as early as possible to give the best outcome

Interim conclusions (2)

- All key stakeholders should be made aware as early as possible that sprinklers are to be installed so that the sprinkler system is integrated into the overall design
- Good communication between all key stakeholders is essential at all stages to resolve any arising issues, resulting from or impacting sprinkler system
- Where communication and co operation is good between all the stakeholders, installation of sprinkler system can be quick and efficient

Interim conclusions (3)

- Water supplies issues have been highlighted by most of the stakeholders as their major concern during the pre-installation stage and this has continued to be expressed at subsequent stages, except for one scheme
- Water supplies choices for the sprinkler system (mains fed, boosted mains, pump and tank), except for one case, have not been confirmed at the pre-installation phase with all relevant stakeholders, including the water company, which has resulted in delays, difficulties and potentially higher costs

Interim conclusions (4)

- No declared issues concerning compliance with AD B Wales at the pre-installation and installation stages
- No declared issues concerning compliance with BS 9251 at the pre-installation and installation stages, except for one case at sprinkler system commissioning, resulting from problems on site with water supplies

Interim conclusions (5)

- Cost estimates for design and installation of the sprinkler system have been collected at pre-installation stage, but not all broken down by building type
- Confirmed costs for the design and installation of the sprinkler system have been obtained at the post-installation stage, for each building type
- Water supplies costs, water company charges and building works in connection costs, where applicable, have also been confirmed at the post-installation stage



Thank you

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