

# SPRINKLER SYSTEMS



# What is a Sprinkler System?

- An array of pipework to distribute water to the location of a fire

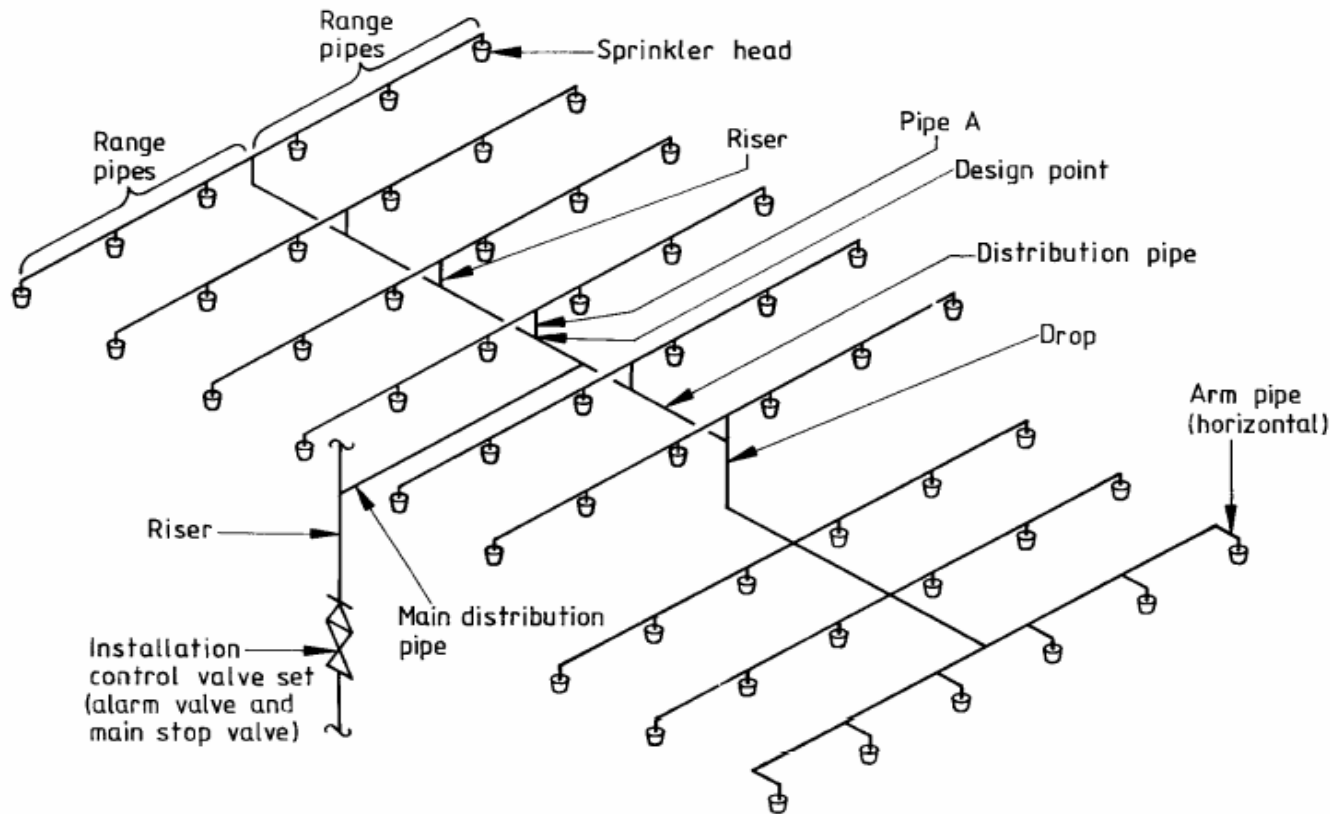


Figure 1 — Main elements of a sprinkler installation

# Brief History

1874 – An American Henry Parmelee the first system to be commercially developed.

1882 – First UK system was installed at John Stones & Co, Astley Bridge, Bolton.

1888 – 1st Edition FOC Rules published by insurers

1888 – 1969 Original FOC rules are regularly updated up to 28th Edition

1969 – FOC Rules are completely re written and issued as 29th Edition

1990 – BS5306 part 2 developed from 29<sup>th</sup> Edition

2003 – BS5306 part 2 is superseded by EN12845



- What do all these movies have in common
  - Casino Royale (2006)
  - Accepted (2006)
  - The Incredibles (2004)
  - The SpongeBob Square Pants Movie (2004)
  - Changing Lanes (2002)
  - The Matrix (1999)
  - Lethal Weapon 4 (1998)
  - Hocus Pocus (1993)
  - Die Hard (1988)
- In each case the hero's actions resulted in ALL the sprinklers activating

# Common Myths

- All the sprinklers operate - this is perpetrated mostly by television, film and other media. Anyone watching a television drama, an advert or a movie will recognise the comedy value of all the fire sprinklers in a building going off and everyone getting drenched. That is good slapstick fun, but it is just not true.
- Water Damage – Sprinklers use about 5% of the water used by firefighters hoses.
- Accidental activation – this is estimated to be 16 million to 1
- Sprinklers are expensive – recent cost benefit analysis has proved this to be untrue. Fire losses run at £1 billion every 5 years and 1000 jobs lost every year. Environmentally 155,000 tones of CO2 are released as a result of major fires And what price is a life.

20 Nov 1992



# Windsor Castle

- There is a famous quote from a senior Minister who, on visiting the scene, remarked, “Thank goodness the building was not sprinklered,” indicating the level of misunderstanding about sprinklers at the highest levels of Government. In fact, as a result of the building not being sprinklered, we lost £6 million-worth of national treasures and repairs cost £36.5M.

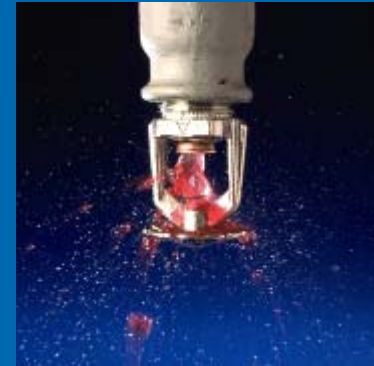


- Firefighters used over one million gallons (4,500 tons) of water fighting the fire. Nine principal rooms and over 100 other rooms over an area of 9,000 square metres were damaged or destroyed by the fire. This was approximately one fifth of the castles area.
- Firefighters agree that a single fire sprinkler head (60 litres/minute over 12 square metres) could have controlled the fire at the start. Although no doubt there would have been uproar about water damage.
- Sprinklers were not installed in the restored building!

# How do Sprinklers work ?



1 - The sprinkler bulb contains a dyed liquid with a small air pocket



2- Heat expands the liquid, the air is compressed and the glass shatters



3 - Water pressure pushes the remains of the bulb away



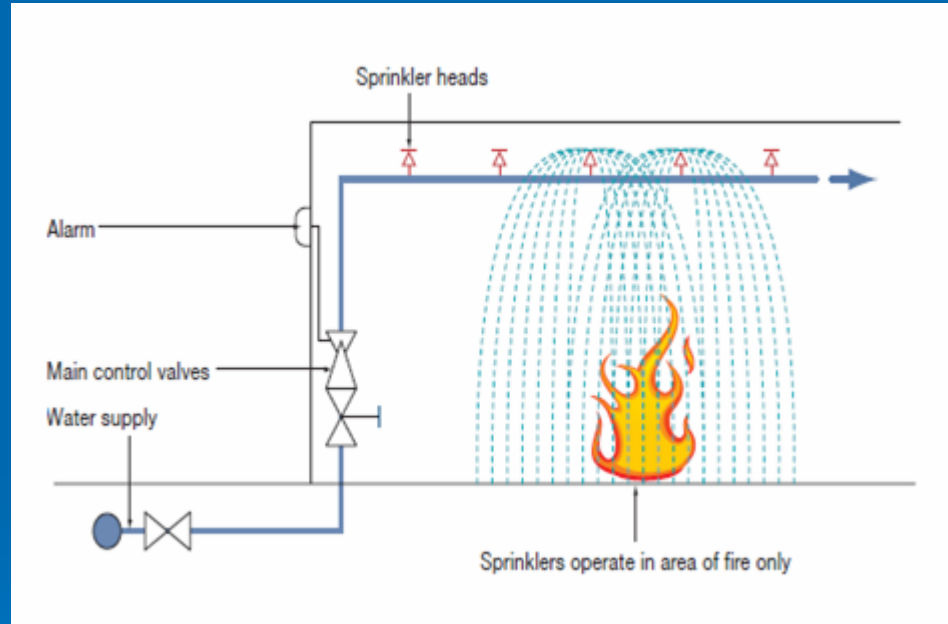
4 - Water hits the deflector and is sprayed onto the fire



# What do Sprinklers do?

Sprinklers are the only system which will automatically:

- Detect a fire
- Sound an alarm
- Call the fire brigade
- Fight the fire
- Minimise the impact of the fire



Sprinklers do not necessarily extinguish a fire, they are designed to control the fire by wetting the surrounding area.

# Standards

- FOC and LPC rules – Property protection (insurers standards)
- BS5306 part 2 – Property & Life Safety
- BSEN12845 – Property & Life Safety
- BS9251 – Residential & Domestic Sprinklers – Life Safety

8 May 1979



# Woolworths Manchester

- 500 customers and staff were inside the building when the fire broke out
- 10 people died
- 26 people were rescued by the fire brigade
- It is believed that the fire was started by a damaged electrical cable that had furniture stacked in front of it.
- The furniture was constructed of polyurethane foam which once alight, produced large amounts of dense smoke which obscured the exit signs, affected people's vision and caused breathing difficulties.
- An inquiry found that although the building met all relevant legal requirements at the time, the casualty rate was in part due to the lack of a sprinkler system to stop the spread of the fire, partly because of the polyurethane foam used in the furnishings, partly because of the failure of the fire alarms and also because of the behaviour of the customers.

# Woolworths Fire

- The fire prompted a number of actions by the Home Office. The laws on fire precautions, building design and safety certification, and the regulations governing furniture design were updated.
- The local Manchester Act required all buildings over 2000 sq. m. to be sprinkler protected.
- The Manchester store was reinstated at the expense of the insurer, with sprinklers.
- But ten lives was a very high price to pay for the learning. ■

# UK Legislation

- Wales – New and converted domestic and residential properties, excluding hotels, prisons and hospitals will require sprinklers from 1 Jan 2016.
- Scotland – Since 2005 sprinklers are required in new Shopping Centres, Residential care Buildings, High Rise Domestic Buildings and Sheltered Housing Complexes and since 2010 Schools.
- England - Building regulations and Approved Document B (this as replaced all local “Acts” except London) apply, these cross refer to various other standards and regulations and lean heavily towards Fire Engineered Solutions which inevitably means cost is the main criteria.
- Sprinklers can be included as a compensatory fire safety feature in the design of dwelling houses, but for flats in buildings over 30m high, sprinklers are mandatory but not in common areas.

# UK Legislation

- In England and Wales sprinklers are required in commercial and business premises over 20,000 square metres, In Scotland the figure is 14,000 square metre, This compares poorly with most of Europe where the figure is 2,000 square metres
- The Regulations allow Trade-offs in terms of fire precautions when life safety sprinkler systems are installed such as reductions in fire ratings for the building and also modifications to escape travel distances, number of fire escapes etc. Further trade-offs could be developed as part of a fire engineered solution for a building.
- So when asked by a business “can I turn of my sprinklers” for what ever reason, the answer is not so straight forward.

# 2 August 1973





# Summerland

- Summerland was designed to accommodate up to 10,000 tourists.
- It was a mainly a 1960's concrete design incorporating many "state of the art" architectural features such as acrylic "glass" in part of the roof, acrylic sheet linings and bitumen coated asbestos panelling, on some external elevations.
- The fire was started by 3 children smoking in a disused kiosk. The burning kiosk collapsed against the bitumen coated panelling, spread up to the acrylic roof.
- 50 people died
- Changes to building regulations to improve fire safety were introduced.
- The centre was rebuilt in 1977 on a smaller scale, with non combustible materials, fire walls and doors, a highly advanced alarm system and sprinklers throughout.
- Now all public buildings on the Isle of Man are sprinkler protected.

# Water

- A sprinkler system requires a suitable water supply that is
  - Adequate (meets the requirements of the design)
    - Pressure - to push water through the pipes
    - Flow - to provide the required quantity of water
  - Reliable
    - Can the water supply be interrupted?

# Towns Main Water Supplies

- The most basic and cheapest water supply
- Towns mains are not in the ownership of the insured and therefore there are a number of potential problems that can occur:
  - Reduction in mains pressure
  - Leaving stop valves on the main partially closed
  - Towns main improvements!

# Pumped water supplies

- Most reliable water supply
- Under the control of the end user.
- Needs regular maintenance
- Requires a stored water source such as a water tank.
- 2 pumps and 2 tanks are required for life safety systems



# What does a sprinkler system cost?

- Conventional Sprinklers - £10 / m<sup>2</sup>
- In Rack Sprinklers - £25 / m / level
- ESFR Sprinklers - £14 / m<sup>2</sup>
- Water Supply (2 pumps, 1 tank) £150k+
- Insurance discounts of up to 60% of the fire rate can help to offset some of the cost in the long term.

# What have we learnt

- Next time you see all the sprinklers operate in a movie you will annoy your friends by saying “ that’s not right”
- UK sprinkler legislation is not definitely not proactive
- Sprinklers may be expensive but putting a value on a successful activation is virtually impossible
- End Users always complain that the water damage was worse than the fire.
- Insurance companies and fire authorities love sprinklers

Thank

You

