

#21



# Wet & Dry Riser Designed to BS 9990

**A rising main is a system of pipework, valves and outlets on each floor often found in high-rise buildings, which allows firefighting water to be easily delivered to all floors. Rising mains in buildings can be either filled with water (Wet Riser) or empty (Dry Riser).**

Where mains are supplied from rooftop tanks and pumps in very tall buildings, the mains are referred to as 'Falling Mains' or sometimes 'Downcomers'. The risers remove the need for firefighters to have to drag charged fire hoses all the way up a tall building which could delay firefighting operations or create a hazard during evacuation. The British Standard used for design, installation, testing and maintenance of Wet and Dry Risers is: BS9990 Non-automatic firefighting systems in buildings Code of practice.

Approved Document B (Fire Safety) of the Building Regulations (England & Wales) requires that any building more than 18m high, measured from the fire brigade access level to the top floor, or which has floors more than 10m below ground must be provided with 'firefighting shafts' and a firefighting rising main. If the building has a floor level higher than 18m but less than 50m or has floors more than 10m below ground, the fire main can be either a Dry or a Wet riser. When a building is more than 50m high the rising main has to be a Wet riser. In Scotland, the Technical Handbooks of Scottish Building Standards contain similar requirements.

## DRY RISING MAINS

The pipes in dry risers are empty and are only filled by the fire brigade when they arrive with water drawn from the nearest fire hydrant and pressurised by the pump on the fire tender. Some fire mains are described as 'falling' mains where they are installed for firefighting below ground level or where a fire water supply is provided at high level

The water is supplied to the Dry Riser from the fire tender pump through the inlet breaching connection on an external wall. The breaching connections are usually contained in a locked red glass fronted box with the wording 'Dry Rise Inlet'.

This inlet should be positioned as close as possible to the rising main in order to reduce pressure losses. The inlet breaching unit for a 100mm diameter dry riser has two 65mm male instantaneous hose connections. For larger diameter dry risers a breaching inlet with four hose connections will be needed. When selecting a location for the inlet breaching valve the first consideration must be the safety of firefighters. An access road, suitable for a fire appliances must be provided. This should allow positioning of the fire appliance to within 18 m and preferably within sight of the inlet box. The lower edge of the inlet box must be located between 400mm and 600mm above the ground. The inlet is fitted with a drain valve to drain water from the dry fire main at the end of operations.

Landing valves have a flanged inlet and a 65mm instantaneous hose connection outlet with removable blank cap and retaining chain, and a handwheel to open and shut the valve. They are installed at each floor level, including the ground floor and should be located inside a red metal box with a glass panel, labelled Wet or Dry Riser. Landing valves can have either horizontal or 'bib nosed' connections with a downwards angle. On Dry Rising mains a landing valve may be installed, at roof level for periodic testing, if required by the authority having jurisdiction. (AHJ)

Usually there is only a single landing valve at each floor level, but two may be provided if required by AHJ's. Landing valves should preferably be located in well-ventilated fire resistant lobbies within the firefighting shafts and must be installed with its lowest point at 750 mm above floor level.

## AIR RELEASE VALVE

An air release valve must be fitted at the top of the Dry riser to expel air when filling the main and allow ingress when draining the system.

**Wet  
riser**



**Dry  
riser**



**BAFSA ADVISORY  
COMMENT:**

**"All Wet and Dry systems should initially be static pressure tested to at least one and half times the system's predicted maximum operating pressure for at least one hour."**

## SECURITY

Riser equipment can have brass or bronze components, by installing them in lockable boxes makes them less susceptible to vandalism and theft.

## WATER CHARGED

When dry mains have a very large volume they can be permanently charged with water from a small water tank of about 300 L capacity with a permanent infill connection to a local water supply which means the fire brigade can commence firefighting operation almost immediately as they do not have to fill the riser pipe-work. An example of where water charged dry mains can be used is in long underground tunnels where the temperature is above 4 C° at all times.

## WET RISING MAINS

The pipes in wet risers are full of water at all times and have automatic pumps and stored water which operate when the pressure in the rising mains drops on the opening of a landing valve.

## PUMPS

If service water supplies is insufficient to serve a wet rising main pumps and tanks will have to be installed. Wet Risers must have two pumps and two tanks. The pumps have to be capable of delivering 1,500 l/min which is enough to supply each of two fire service hoses with 750 l/min. The pump must be capable of providing 8 bar pressure at each of the two operating landing valves. Pump arrangement for Wet risers can be either two electrically-driven units or one electric and one diesel engine driven unit. One is the 'duty' pump, and the other is a standby should the duty pump fail or additional pumping capacity be required. The system has a small capacity 'jockey pump' which starts automatically to maintain system pressure and prevent intermittent starting and stopping of the main pumps.

## POWER SUPPLIES

Where two electrically-powered pumps are used, the preferred power source is two independent incoming electric supplies. If these are not available a single incoming electric supply can be used in conjunction with a separate supply which can be an on-site emergency generator. These two supplies are connected to an automatic changeover panel which ensures that both pumps have power in the event of any power failure. Electric power supplies must be sufficient to allow the wet riser pumps to run for at least 3 hours.

## ISOLATING VALVES

Isolating valves are installed at intervals not exceeding 10 m on the rising mains so that sections can be isolated to enable repairs to be carried out. These valves should be secured in the open position by a chain and padlock or fitted with monitoring devices to indicate at the fire control panel if any valve is not fully open.

## WATER TANKS

An on-site supply of stored water must be capable of supplying enough water to provide two landing valves with not less than 750 L/min each for at least 45 minutes. The total water requirement for a wet riser would therefore normally be 67 500 L. BS9990 requires that the minimum

volume of stored water for a wet riser is two tanks each with a volume of 22 500 L. The other 22 500 L can be supplied automatically to the two tanks from the service main through ball valves fitted to each tank. Another option is to install two tanks each with a capacity of 33 750 L so that there is no dependence a water infill. This allows the fire brigade to use the service main independently.

All wet riser tanks must have a facility to allow the fire brigade to replenish their contents. This is done by installing an inlet breeching connection at a convenient and safe location for the fire brigade to pump water from the service main into the tank/s. High and low water level alarms are fitted to the tanks to monitor the water level. This pipe must be at least 100mm diameter for tanks that are located no higher than 60m above ground level.

It is not usual that water tanks for domestic purposes or sprinklers are used for wet rising mains.

## WATER PRESSURE

The water pressure required at the level of the highest landing valve is 8 bar. For a 60m high building the minimum pressure at the water source could be 15 bar or for a 100m high building it could be 20 bar.

## PRESSURE REGULATING VALVES (PRVs)

PRVs are designed to ensure that the pressure in a fire hose does not exceed 12 bar when the hose jet is shut.

These PRVs are incorporated into the landing valve and regulate the high pressure in the rising main to a safe 8 bar at the hose connection. In BS9990 there is an allowable tolerance for flow and pressure at the landing valve of 750 (±75) l/min at 8 (±0.5) bar.

## TESTING

The system should be completely charged with water to a pressure equal to its design operating pressure measured at the inlet for a period of at least 15 min. During this period, the system should be checked for any leakage of water. Leaks should be repaired and the system re-tested.

All dry fire mains should be checked every six months to ensure that all valves are fully serviceable, and a wet pressure test should be carried out annually to ensure that there is no leakage. Wet fire mains should be similarly checked and, in addition, the water storage tanks and booster pumps should be checked for correct operation.

Defects in equipment should be rectified by a competent person. During repairs a notice should be posted on the building and the fire service should be notified then and as soon as the equipment is serviceable again.

## COMPONENTS FOR RISERS

All components to be installed in any system which is to be connected to the service mains or any water company pipework must comply with the Water Fittings Regulations 1999 or (Scottish) Water Byelaws 2014 and approved for its intended use by the Water Regulations Advisory Scheme (WRAS) [wras.co.uk/](http://wras.co.uk/)

## PIPES & FITTINGS

Fire mains should have a nominal bore of 100 mm, designed to withstand a pressure of 1.5 half times maximum operating pressure. Commonly used pipe for Wet and Dry risers is manufactured to BS EN 10255 non-alloy steel tubes. Fire mains pipework and fittings should be of suitable heavy quality steel and galvanised where necessary. Pipes for Dry risers are normally galvanised.

Pipe fittings can be either screwed, grooved or flanged and are normally galvanised. Usually the straight sections of the rising main are joined with mechanical grooved couplings with a long radius tee at each floor level that connects to the landing valve with a flanged joint.

*If you have a question or seek advice regarding automatic water-based fire suppression systems, please email the team: [Ritchie.oconnell@bafsa.org.uk](mailto:Ritchie.oconnell@bafsa.org.uk) or [joe.mcafferty@bafsa.org.uk](mailto:joe.mcafferty@bafsa.org.uk). If they do not have an answer for you, they will know someone who has! FAQs can be found at [bafsa.org.uk/sprinkler-systems/faqs/](http://bafsa.org.uk/sprinkler-systems/faqs/)*

British Automatic Fire Sprinkler Association

**bafsa**

BRITISH AUTOMATIC FIRE SPRINKLER ASSOCIATION

PO BOX 28683

Edinburgh EH4 9GN

[info@bafsa.org.uk](mailto:info@bafsa.org.uk)

[www.bafsa.org.uk](http://www.bafsa.org.uk)

[facebook.com/SprinklersSaveLives](https://www.facebook.com/SprinklersSaveLives)

[twitter.com/BAFSAfocus](https://twitter.com/BAFSAfocus)

Find us on LinkedIn: BAFSA