Private Fire Hydrants

Types of Fire Hydrant System

A fire hydrant is a connection point to a town water main from which water may be taken for fire fighting purposes. On an underground main the hydrant outlet and valve may take the form of an above ground pillar or be located in an underground pit beneath a cover plate, necessitating the use of a stand pipe. For a fire main within a building, outlets (landing valves) will comprise of direct hose connections with associated isolating valves.

A fire hydrant system will be provided for the purpose of:

- The direct connection and use of hose lines for fire fighting.
- A supply to mobile pumps that boost the pressure to the required magnitude to supply fire fighting hose lines.

Defining this purpose is a key factor in specifying the hydrant outlet pressure and flow performance criteria.

The water supply to a hydrant system may be from a public water supply (town water main) or a private supply via pumps from a stored water source.

Associated Terms & Definitions

Fire Main
A pipe with outlets and control valves installed for the supply of fire fighting water.

Rising Main
A fire main installed within a building with outlets (landing valves) situated at specified floor levels.

Wet Fire Main / Riser
A pressurised water charged pipe with outlets to facilitate the direct connection of fire fighting hose lines. The main / riser is supplied by permanent pumps drawing water from a stored source. A wet riser is typically necessary for buildings in excess of 50m in height to overcome the increased pressure requirement.

Dry Fire Main / Riser
A normally dry pipe into which, utilising mobile pumps, fire fighters can supply water to facilitate the direct connection of fire fighting hose lines close to the point of use.

Inlet / Breeching
A readily accessible facility for the connection of mobile pumps to supply water into a fire main.

Dry Hydrant
A permanent dry suction pipe from a water source (lake or canal) to which a mobile pump can be readily connected to draw water.

Understanding the Risk

The availability of an appropriate and reliable water supply is fundamental to the effectiveness of both public and private fire fighters in limiting fire spread and extinguishing fire.

The magnitude of water supply needs to be considered in terms of:

- Required flow rate.
- Duration of supply.

Factors needing consideration are:

- Nature of the hazard presented by the occupancy.
- Magnitude of the fire load.
- Fire resistance / combustibility of the building construction.
- Physical geometry of the premises in all three dimensions.
- Fire exposure risk from adjacent premises.
- Whether effective automatic fire protection is provided by a sprinkler system.

Various methods for assessing the required water volume for fire fighting operations have been published in different parts of the world utilising methods ranging from the calculation of factors applicable to a premises to generic flow rates for specific classes of occupancy and historic data from fire incidents. These produce requirements indicated by Fowler (2002)[3] to vary by a factor of up to 4.5, this emphasising the need for a considered assessment of water requirements rather than simple specification of generically published figures.

It should be noted that some design codes adopt a simplistic approach to defining the magnitude of the water supply only specifying **minimum** criteria that do not give due consideration to the anticipated fire challenge and care is required when considering the adequacy of such a system for a particular risk.

Hydrant Performance Criteria

The following performance criteria are indicative of the range of criteria for reference only and due consideration must be given to all risk factors when determining required performance criteria for specific applications.

The agreement of proposed system performance criteria should be sought prior to finalisation from American International Group UK Limited and all interested authorities having jurisdiction.

UK Fire Service "ideal requirements for new developments"[2]

- Detached and semi-detached housing developments up to two stories.
  480 l/min from a single hydrant.
- Multi-occupied housing developments of more than two stories.
  1200 – 2100 l/min from a single hydrant
- Transportation service stations and car parks.
  1500 l/min from a single hydrant.
- Industrial developments should have a 150mm nominal diameter main network capable of supplying the following flows dependant upon the development area:
  - <1 hectare 1200 l/min
  - 1 – 2 hectares 2100 l/min
  - 2 - 3 hectares 3000 l/min
  - >3 hectares 4500 l/min
- Shopping centres, offices, recreation and tourism developments.
  1200 – 4500 l/min dependant on nature, extent and height of development.
- Primary Schools
  1200 l/min from a single hydrant.
- Secondary Schools
  2100 l/min from a single hydrant.

BS9990:2015 – Code of Practice for Non-Automatic Fire Fighting Systems in Buildings[1]

For town water main fed systems a minimum flow rate of 1500 l/min is required.

For pumped systems a total flow of at least 1500 l/min shall be provided discharging from two fully open landing valves at a running pressure of 8 bar, with a water supply duration of 45 minutes.

NFPA 291[7] clause 5.1 - Classification of hydrants at 20psi (1.4 bar) residual pressure

AA – > 5680 l/min
A – 3785 – 5675 l/min
B – 1900 – 3780 l/min
C - < 1900 l/min

Practical Considerations

For any private fire hydrant system to be of benefit the system and equipment specification must be fully compatible with the equipment to be utilised by local public and private fire fighters.

Associated signage / labelling is to be in conformance with local standards.

Locate hydrants:

- Where not likely to be obstructed (by parked vehicles, waste containers, etc).
- In a safely accessible position (not against the building, between 6m – 90m distant).
- Regularly spaced a suitable distance for the purpose (90m for direct use with hose lines).

Where a hydrant system is to be used in conjunction with mobile fire pumps due consideration needs to be given to facilitating adequate access and manoeuvring space for vehicles together with hard standing with adequate load bearing capability.

The configuration of private hydrant mains as rings aids the flow of water to all hydrants. A ring incorporating strategically located zone valves facilitates maintaining most hydrants operable in the event that part of the system needs to be isolated to repair a leak or enable modification. Zone isolating valves need to be appropriately secured and clearly indicate their status (post indicator / outside screw and yolk valves).

Hydrant systems installed in areas that may be subject to freezing temperatures will need to incorporate relevant frost measures.

Hydrant outlet valves shall be provided with adequate physical support to counter the forces that fire fighters may apply to open a stubborn valve without imposing a load on the main pipe / fittings.

Appropriate measures need to be provided to protect hydrant valves and associated equipment from malicious damage or theft.

Town water main fed systems need to satisfy the requirements of the water supplier in respect of preventing contamination of potable water supplies and measures to prevent the collapse of their supply mains.

Where a town water main water supply is metered, to enable the supplier to charge when water is used for purposes other than fire fighting, a full bore meter by-pass valve shall be installed with its location and purpose clearly indicated.

Hydrant systems utilising a private pumped water supply shall comprise of duplicate automatic starting pumps.

Systems need to be hydraulically engineered to ensure the standing and running pressure at each outlet is of an appropriate magnitude for the purpose. This is particularly relevant for wet risers in tall buildings to ensure the outlet pressure at lower levels does not exceed safe limits (10 bar).

Duplicate water storage tanks shall be provided, configured so that water can be independently supplied from either tank to both pumps if any one tank is out of commission. Tanks shall have appropriate emergency replenishment facility (fire service inlet).

Where it is proposed to utilise an open water source due consideration needs to be given to the reliability of the supply. The water levels of lakes and rivers may be low in periods of drought and canals can be drained for maintenance.

Maintenance & Servicing

Regular testing and maintenance of hydrant systems is needed to ensure all equipment remains in operable condition and to verify the continued adequacy of the water supply.

The testing of town's main fed hydrants can have a detrimental effect on water quality in the local supply network and is only to be carried out in conformance with the conditions of the water supplier.

References

1. BS9990:2015 – Code of Practice for Non-Automatic Fire Fighting Systems in Buildings.
2. Local Government Association and Water UK (3rd Edition January 2007) *National Guidance Document on the Provision of Water for Fire Fighting*
3. Neal Fowler (Kent Fire Brigade) April 2002, International Research Project Conference Paper *Improved Calculation of Fire Fighting Water Flow Requirement – The Key to Strategic Management of Fire Hydrant Provision*
4. Paul Grimwood (Kent Fire & Rescue Service) – Fire Risk Management Journal, March 2010 *Flow Method*
5. NFPA 24, *Standard for the Installation of Private Fire Service Mains & their Appurtenances*
6. NFPA 25, Standard for the Inspection, Testing & Maintenance of Water Based Fire Protection Systems
7. NFPA 291, *Recommended Practice for Fire Flow Testing & Marking of Hydrants*
8. NFPA 1142, *Standard on Water Supplies for Suburban and Rural Fire Fighting*
9. NFPA Handbook, Section 7, Chapter 22 *Alternate Water Supplies*
10. NFPA Handbook, Section 10, Chapter 3 *Water Distribution Systems*
11. NFPA Handbook, Section 10, Chapter 4 *Water Supply Requirements for Public Supply Systems*
12. NFPA Handbook, Section 10, Chapter 6 *Determining Water Supply Adequacy*

For further information contact your local AIG risk engineer.

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