

Manual Fire Fighting Water Supplies

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Hydrants are the primary source for the supply of water for fire fighting purposes. This document contains guidance on providing adequate water supplies for fire fighting purposes.



Manual Fire Fighting Water Supplies



Introduction

Regardless of whether a building has automatic fixed sprinkler protection, when a fire starts, at some point either a trained private emergency response team or the public fire fighting services will need to use hoses and water to manually extinguish it. How much water needed is dependent on so many variables....and how much water is available is very much dependent on any private water supplies, local water courses and the local public water supply networks.



We repeatedly see fires and losses grow due to inadequate fire water supplies both for the amount of water that is available (demand) and the length of time the water is available (duration). This coupled with inappropriate access to, or coverage of, water supplies around a property, can lead to situations where the manual response travels large distances to obtain an appropriate fire fighting water supply. In some cases, this may be miles. This can target water mains, tanks, ponds, lakes, rivers and other water courses....and every minute that passes where the amount of water needed is not available to fight a fire, the fire will continue to grow and as a consequence more water is needed to suppress this growing fire. There is also more environmental impact from airborne and water borne pollution.

In such an emergency, if we assume all personnel are safely evacuated out of a building, the impact of having an inadequate fire water supply is a growing property damage and business impact exposure.

As a concerned individual or business, it is not correct to assume there is the 'right' amount of fire water available or that it is readily accessible in the local area. Further investigation and ongoing confirmation are needed.

Factors Which Influence How Much Water is Required for Effective Fire Fighting

The smaller the fire, the less water is required for the manual fire fighting efforts needed to control and extinguish it. Therefore, when considering how much and where this water is needed, factors to be taken into account include:

- The length of time from the fire starting to any manual fire fighting efforts starting?
 - Having the correct resource based on the conditions of the fire
- How the fire alarm is raised; consistently and reliably 24-hours per day to a constantly attended location?
 - Automatically – automatic fire detection
 - Manually – break glass alarms or pull stations or telephone call to the public authorities
- Provision of any appropriately designed, installed, and maintained fixed automatic fire suppression systems to suppress the fire at its seat?
- Building construction and levels of internal fire compartmentation?
 - Including building linings and internal partitioning
 - Height and number of stories
- Nature, size, and continuity of combustible loading?
- Wind/environmental conditions?

LOSS PREVENTION STANDARDS

- Topography; nature of the surroundings; nature of access to building?
 - Access to all sides of the building
- Access to the seat of the fire area within the building?
- Defensive fire fighting only – external to a building?
 - Buildings are designed to keep rain and water out so in a fire situation how will water from an external hose enter a building and to **where it's needed** at the seat of a fire?
- Offensive fire fighting – within the building, directly targeting the seat of the fire?
- What the building on fire exposes, can the fire spread to nearby buildings or storage, etc.?
- The values of the property and the business risk exposed?

How Much Water is Actually Needed?

When considering how much water is **needed** it's a bit like asking how long is a piece of string?

- As much as is available?
- As much as is needed?
- How much is this?

Assuming there is no danger or threat to life, the aim is to extinguish the fire with the minimum amount of property damage, and impact to the business and environment. This is obviously the desired outcome, but in reality, it can be very different. Fire fighting water shortage can have an impact on the effectiveness of the fire fighting tactics by the Fire and Rescue Services and increase the risk of substantial fire losses.

Experience has shown that water usage in a fire is very much dependent on all the variables listed earlier. Aviva has seen up to 9000 litres per minute (l/min) of water being deployed by the fire service for several days, for a high hazard occupancy fire. This is a huge amount of water and it was fortunate the site in question was close to a large inexhaustible and accessible water source (river) and that the agencies involved sanctioned this approach for this duration.

From the [Fire and Rescue Services Act 2004 Section 38](#): *'A fire and rescue authority must take all reasonable measures for securing that an adequate supply of water will be available for the authority's use in the event of fire'*.

- For any facility - what is reasonable in relation to property damage and business impact?

There is, at the present time, no legislation which requires water companies to provide minimum flow and pressure rates for fire fighting purposes. There is guidance for certain occupancies, **but this is just guidance. It isn't based on** the specifics of a building or occupancy and it is not underpinned by regulatory or jurisdictional enforcement.

It should also be borne in mind, that the primary role of the Fire Authority is to save lives. The protection of a property and its business is not a primary focus of their activities. However, every minute a fire burns the property damage increases, impacting the operations within that building and subsequent consequential loss to the organisation.

In the UK from the [Building Regulations Approved Document B](#) - Requirement B5: Access and facilities for the fire service, there are only two requirements as follows:

- 1) The building shall be designed and constructed so as to provide reasonable facilities to assist fire fighters in the protection of life
- 2) Reasonable provision shall be made within the site of the building to enable fire appliances to gain access to the building

The Building Regulations make no stipulation or requirements for fire water for minimising property damage nor business interruption, as this document is driven by life safety requirements.

The National Guidance Document on the Provision of Water for Fire Fighting 2007 published by the Local Government Association and Water UK, details the following water supplies as the minimum needed for manual fire fighting requirements:

Housing

- 480 l/min for detached or semi-detached houses of not more than two stories
- Up to 2100 l/min for properties of more than two stories from any single hydrant on the development

Transportation

- 1500 l/min for lorry/coach parks, multi-storey car parks and service stations from any hydrant on the development or within a vehicular distance of 90m from the complex

Industry (industrial estates)

Water supply infrastructure should provide as follows with the mains network on site being normally at least 150 mm nominal diameter:

- Up to one hectare 1200 l/min
- One to two hectares 2100 l/min
- Two to three hectares 3000 l/min
- Over three hectares 4500 l/min

High risk units may require greater flowrates.

Shopping, Offices, Recreation and Tourism

- From 1200 l/min to 4500 l/min depending on the extent and nature of the development

Education, Health and Community Facilities

- Village halls should have a minimum of 900 l/min through any single hydrant on the development or within a vehicular distance of 100m from the complex
- Primary schools and single storey health centres should have a minimum of 1200 l/min through any single hydrant on the development or within a vehicular distance of 70m from the complex
- Secondary schools, colleges, large health and community facilities should have a minimum of 2100 l/min through any single hydrant on the development or within a vehicular distance of 70m from the complex

All the above is generic guidance, essentially provided for life safety purposes and does not take into consideration any property, business, exposure, environmental factors, or other variables, such as the values at risk or any learnings from losses and claims from the Insurance Industry.

LOSS PREVENTION STANDARDS

The above generic guidance should be the absolute minimum amount of water available for manual fire fighting purposes, when reviewing a risk based on its occupancy, consider providing the following:

- Light and ordinary hazard occupancies, e.g. churches and offices, 1900 l/min
- Extra/high hazard occupancies, e.g. saw mills and plastic manufacturing, 2800 l/min to 3800 l/min
- High bay storage/warehousing at least 4500 l/min

If supplied by a water main, the pressure needs to be such that the main cannot collapse/be sucked dry by a fire brigade pumper section; so, a minimum of 1 bar (15 psi) residual pressure should be realised in the supply at these flow rates.

This demand should be assessed against the risk in question and could be *increased by at least a factor of 25%*, based on any of the following conditions applying:

- Possible delays from the public brigade or on site manual fire fighting team response
 - Remote location; volunteer; limited resource; long travel time; incorrect resource or equipment for the hazards on site, etc.
- Predominantly combustible construction
 - Timber frame
 - Combustible-core sandwich panels
 - Modern methods of construction
- Large open plan buildings having none or limited fire compartmentation
- Significant property or business values exposed
- Properties without automatic sprinkler protection
- Limited access to the seat of the fire
 - Large buildings or long travel distances
 - Remote locations within a building

This should be reviewed on a case by case basis, understanding what is exposed and what manual fire suppression and response would look like in reality.

Where a building is not sprinkler protected or there is a significant amount of combustible external yard storage and manual fire fighting is the only means to suppress and extinguish a fire, the recommended demands above may again require individual review based on the variables as described previously.

Water Duration

How long should the water demand for fire fighting be available?

Aviva recommends the duration of the recommended water supply should be at least:

- 2-hours for light and ordinary hazard occupancies
- 3-hours for extra/high hazard occupancies
- 4-hours for high bay storage/high hazard commodity warehousing occupancies

How Much Water is Actually Available?

When looking at the availability of water for fire fighting, the general view is to consider public water mains supplying public (or private) hydrants.

Has consideration been given to how a fire would be manually suppressed at the most remote parts of the site away from the public highways or the actual distance from the hydrants closest to a building?

Questions to consider include:

- Where are the hydrants in relation to the entire property?
- Are they clearly labelled, fully accessible and protected to prevent vehicle damage and obstruction?
 - What about during the winter if covered by snow and ice?
- Is there accessible hydrant distribution around all sides of a building and across all areas of a site?
 - Are hydrants spaced approximately 75m to 90m around the site?
 - Are all areas of the site easily reachable by the available fire water supply?
 - Has the failure or impairment of the closest hydrant been considered? Where is the next available hydrant?
 - Aviva has seen many losses where the closest hydrant is impaired or has performance issues that compromise the available water supply
- Has the local water supply been tested?
 - When/what time of day/year?
 - How often is it tested?
 - Is this formally recorded and trended?
 - Is this assessed to the fire risk a building/occupancy may present?
- Has this been discussed with the local fire and water authorities?
 - Is it incorporated into an Emergency Response Plan for the site?

From a concerned management is it right to have an Emergency Response Plan that does not consider how much water is available for manual fire fighting, and the impact that it may have on a building or site?

From [Approved Document B Volume 2](#) – Requirement B5 Section 16: Fire mains and hydrants, guidance on the provision of private hydrants is as follows:

16.8 A building requires additional fire hydrants if both of the following apply:

- a. It has a compartment with an area more than 280m²
- b. It is being erected more than 100m from an existing fire hydrant

16.9 If additional hydrants are required, these should be provided in accordance with the following:

- a. For buildings provided with fire mains – within 90m of dry fire main inlets
- b. For buildings not provided with fire mains – hydrants should be both of the following:
 - i. Within 90m of an entrance to the building
 - ii. A maximum of 90m apart

If mains and hydrants are the means of providing water for manual fire fighting, then Aviva recommends:

- Appropriately sized and routed mains capable of supporting the hydraulic characteristics for recommended demands
- Hydrants spaced between 75m and 90m (depending on the risk) so that all sides of a property are readily accessible

Canals, Lakes, Reservoirs, Rivers, Ponds and Open Bodies of Water

In many instances, confidence that enough water will be available is provided from open bodies of water located in the area. However, are these water sources:

- Available with appropriate consent for use for manual fire fighting, e.g. Environment Agency, Water Utility Company, Sites of Special Scientific Interest, etc.?
- Is this part of the response plan from the local fire authorities and do they have the correct access and equipment?
- Is it accessible and available at all times of the year?
 - For personnel safety:
 - Is there a safe embankment or platform to access the water?
 - Is there appropriate lighting?
 - When overgrown by vegetation in summer?
 - Reduced water levels in long dry periods or droughts?
 - In high water levels such as floods or when banks are topped?
 - When frozen in winter?
 - Not only is the water not accessible because of ice but the available water volume is compromised by the thickness of the ice
 - Is the river tidal?
 - When is the tide out?

Sea Water

If a property is located close to the sea or brackish water, will the public brigade use the sea water? The salt content of sea water can have a direct and detrimental impact on their equipment.

This provision should be discussed with the local fire fighting authority including establishing at what stage in a fire if or will sea water be used to fight the fire:

- As soon as possible?
- As a last resort?
- What about if the tide is out?
- **What about if it's a stormy night**, etc.?

Have these been factored into an Emergency Response Plan?

Other Factors Influencing Water Availability

Water Pressure

In the UK and other countries, due to issues with water main leakage rates, management of underground mains has seen repeated pressure reductions over the years. This has a direct impact on the availability of water supplies for manual fire fighting needs.

In addition, if there is a fire and suddenly water is taken from the water main for hoses, the utility company may assume that this is a leak and reduce the water main pressure further. Aviva has seen this occur several times. As a result:

- In a fire situation who is responsible for liaising with the water company to indicate it is a real fire and to ensure they do not reduce the water main pressures **thinking it's a leak**?
 - The public brigade?
 - The site emergency response team?

Summer Months/Drought

In summer months, and especially during prolonged dry periods when people are watering gardens more, there may be challenges with water supplies and issues such as hose pipe bans, etc. coming into force. As a result, the water pressure in the underground mains is lower, and the amount of water available when there is an emergency may be compromised.

Water levels in open bodies of water may also be reduced during summer months.

Impairments and Utility Company Work

As a water customer there is no direct control on the water supply available from the utility company. Therefore, if there is work ongoing on the water network including valve closures, main breaks, etc., as an end user is this known?

Is there an obligation from the utility company to inform a property of issues on their water network? If there is an impairment to the water supply at the time a fire starts, this could have a direct impact on the availability of water for fire fighting purposes.

What if There is Not Enough Water?

After considering all the variables and understanding what water supplies are currently available, what if there is not enough water to appropriately protect a risk, what should and could be done?

If the decision has been taken to not provide automatic sprinkler protection within a building, then the only means to suppress a fire is manually. Therefore, the question to consider is:

- Where will the manual fire fighting water supply be available from?

Once qualified and quantified, if the local water mains and local water courses cannot provide what is needed, what are the options?

- An above or below ground tank connected to and filled by:
 - The public water main?
 - A rain collection system from a building roof?
 - A rain/surface water drain collection system from the ground?

Note: Non potable water collection systems may require filtering and cleaning arrangements

- A public fire brigade hose header to allow suction to be taken from the tank?
- Private pump(s) discharging to a private main and hydrant distribution system around the site/building?

The aim should be to ensure a risk has the right amount of water, distributed to all areas, readily accessible and available consistently and reliably 24-hours per day, 365-days per year.

From [Approved Document B Volume 2](#) – Requirement B5 Section 16.13: Alternative supply of water, guidance on the alternative source of water supply should be one of the following, subject to consultation with the local fire and rescue service:

- a) A charged static water tank with a minimum capacity of 45,000 litres
- b) A spring, river, canal, or pond that is capable of fulfilling both of the following conditions:
 - i. Providing or storing a minimum of 45,000 litres of water at all times
 - ii. Providing access, space and a hardstanding for a pumping appliance

Note: Remember that Approved Document B is primarily for life safety requirements and not property or business exposures. The 45,000 litre capacity is a generic volume and this is not specified based on the risk itself - construction type, size of building, occupancy hazards, fire load, values, exposures, etc. Aviva recommends the previous demands and durations based on the risk type, to create the required manual fire fighting water stored volumes, e.g. an ordinary hazard occupancy with no further risk modifications should have at least 1900 l/min for 2-hours or 228,000 litres of water available.

Fire Water Run-off

As a result of any fire there will be contaminated fire water run-off which may potentially cause environmental pollution. A strategy to manage this risk should be included in your Emergency Response Plan. While this document does not specifically make any recommendations around this, please be aware that the direct impact of a fire and applying water means there will be fire water run-off. For further information please refer to the Aviva Loss Prevention Standard *Preventing Pollution from Fire Fighting Run-off*.

The size and nature of the fire (and its products) and the length of time to extinguish it, will have a direct impact on this 'hazardous' by-product:

- How is this managed and contained – pathways of how fire water run-off may enter the environment, e.g. surface water drains?
- How is this treated or disposed of?
- What is exposed?
- How can this impact the amount of water the manual fire fighting efforts may use in the life cycle of the fire incident?
- How will any public bodies such as the Environment Agency act in an actual emergency?

Public Fire Authorities and Emergency Plans

As with anything fire-related, it is good practice to engage with the public fire authorities. It is worth understanding how they will respond in an emergency; what resources would respond; where they would get their fire water from; whether they consider this to be appropriate based on the property and business risk on site and how they would protect the buildings?

It is always worthwhile inviting the local fire authorities to a site, at least annually, and when there are any changes planned...**after all in an emergency they will be responding, day or night, rain or shine, winter, or summer.**

To help with understanding what resources there are available in a local area (UK only) the RISC Authority has an online Fire and Rescue Service Response database, [click here](#) for further details.

Managing Change

As part of any change to a local area or site, consideration should be given to the impact on the water supplies, its distribution, and its availability.

Consider such things as:

- Local water course re-routing
- Land draining
- Local housing or industrial developments and the impact on the water supply
- An extension on site changing the topography and layout
- A change on site that impacts the occupancy hazards or the nature of the construction

Checklist

A generic Manual Fire Fighting Water Supplies Checklist is presented in Appendix 1 which can be tailored to your own organisation.

Specialist Partner Solutions

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For more information please visit:

[Aviva Risk Management Solutions – Specialist Partners](#)

Sources and Useful Links

- [Fire Protection Association](#)
- [RISCAuthority](#)
- [Approved Document B – Volume 2](#)
- National Guidance document on the provision of water for fire fighting (January 2007 3rd Edition) – Local Government Association
- Fire Service Manual: Volume 1- Fire Service Technology Equipment and Media – Hydraulics, Pumps and Water Supplies
- [Pollution prevention for businesses](#) – GOV.UK

Additional Information

Relevant Loss Prevention Standards include:

- Contamination Following a Fire
- Emergency Response Teams
- Managing Change – Property
- Preventing Pollution from Fire Fighting Run-off

To find out more, please visit [Aviva Risk Management Solutions](#) or speak to one of our advisors.

Email us at riskadvice@aviva.com or call 0345 366 6666.*

*Calls may be recorded and/or monitored for our joint protection.

Appendix 1 – Manual Fire Fighting Water Supplies Checklist



Location	
Date	
Completed by (name and signature)	

	Fire Fighting Water Supplies Checklist	Y/N	Comments
1.	<p>Based on the occupancy of the site is the hazard classification established?</p> <ul style="list-style-type: none"> • Light or ordinary hazard? • Extra/high hazard? • Storage/warehousing hazard? 		
2.	<p>Is the construction of the buildings known?</p> <p>Is this predominantly non-combustible?</p>		
3.	<p>Are there any variables that will have an impact on the manual fire fighting activities on site?</p> <ul style="list-style-type: none"> • Possible delays from the public brigade or on site manual fire fighting team response? • Predominantly combustible construction: <ul style="list-style-type: none"> ○ Timber frame? ○ Combustible-core insulated metal sandwich panels? ○ Modern methods of construction? • Large open plan building with no or little compartmentation? • Large property values or business impact? • Is the property sprinkler protected? • Could there be limited or restricted access to the seat of a fire? <ul style="list-style-type: none"> ○ Large buildings or travel distances? ○ Remote locations? <p>If yes to any of the above then the water available for manual fire fighting requirements may need to be adjusted.</p>		

LOSS PREVENTION STANDARDS

	Fire Fighting Water Supplies Checklist Contd.	Y/N	Comments
4.	Do you know where the fire hydrants are in relation to the buildings or site? <ul style="list-style-type: none"> • Are these public only? • Are there any private fire hydrants? 		
5.	Do the fire hydrants cover all sides/areas of the buildings and site? Are the fire hydrants spaced every 75m to 90m apart?		
6.	Has the water supply to the hydrants protecting the site been tested?		
7.	Does this water supply meet the following demand criteria (select as appropriate for the risk): <ul style="list-style-type: none"> • Light and ordinary hazard occupancies 1900 l/min? • Extra/high hazard occupancies 2800 l/min to 3800 l/min? • High bay storage/warehousing at least 4500 l/min? 		
8.	Does this water supply meet the following duration criteria: <ul style="list-style-type: none"> • 2-hours for light and ordinary hazard occupancies? • 3-hours for extra/high hazard occupancies? • 4-hours for high bay storage/high hazard commodity warehousing occupancies? 		
9.	Is the water supply test data formally recorded and trended?		
10.	Are repeat tests planned in the future? What is the planned return frequency?		
11.	Are there any other water courses or open bodies of water available in the area that can be used for manual fire fighting means, e.g. reservoirs, ponds, lakes, canals, rivers and the sea? Is this: <ul style="list-style-type: none"> • Availability formally quantified and recorded? • Available all times of the day or is it tidal? • Available all year round or do seasonal changes impact water availability, e.g. winter freezing, summer reduction levels, etc.? 		

LOSS PREVENTION STANDARDS

	Fire Fighting Water Supplies Checklist Contd.	Y/N	Comments
12.	<p>Are there any stored water volumes in tanks available for manual fire fighting, either above or below ground?</p> <p>Is this:</p> <ul style="list-style-type: none"> • Availability formally quantified and recorded? • Available all times of the day or do levels fluctuate? • Available all year round or do seasonal changes impact water availability, e.g. winter freezing, summer reduction levels, etc.? 		
13.	<p>Are the manual fire water and fire fighting plans discussed regularly with the public fire authorities?</p> <p>Is the public fire brigade invited to attend the site at least annually?</p>		
14.	<p>Does the site have a formal Emergency Response Plan?</p> <p>Is someone identified to liaise with the public fire authorities and the local water utility company?</p>		
15.	<p>Have there been any changes or are there any proposed changes that can impact the assessments made of the risk and the amount of fire water needed for manual fire fighting purposes, e.g. change of occupancy/new hazards; increased fire load; new or temporary construction with combustible elements?</p>		

16.	<p>Additional comments:</p>
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