Dual MIST
TECHNOLOGY

ADVANCED WATER MIST TECHNOLOGY

THE FUTURE OF FIRE SUPPRESSION SYSTEMS

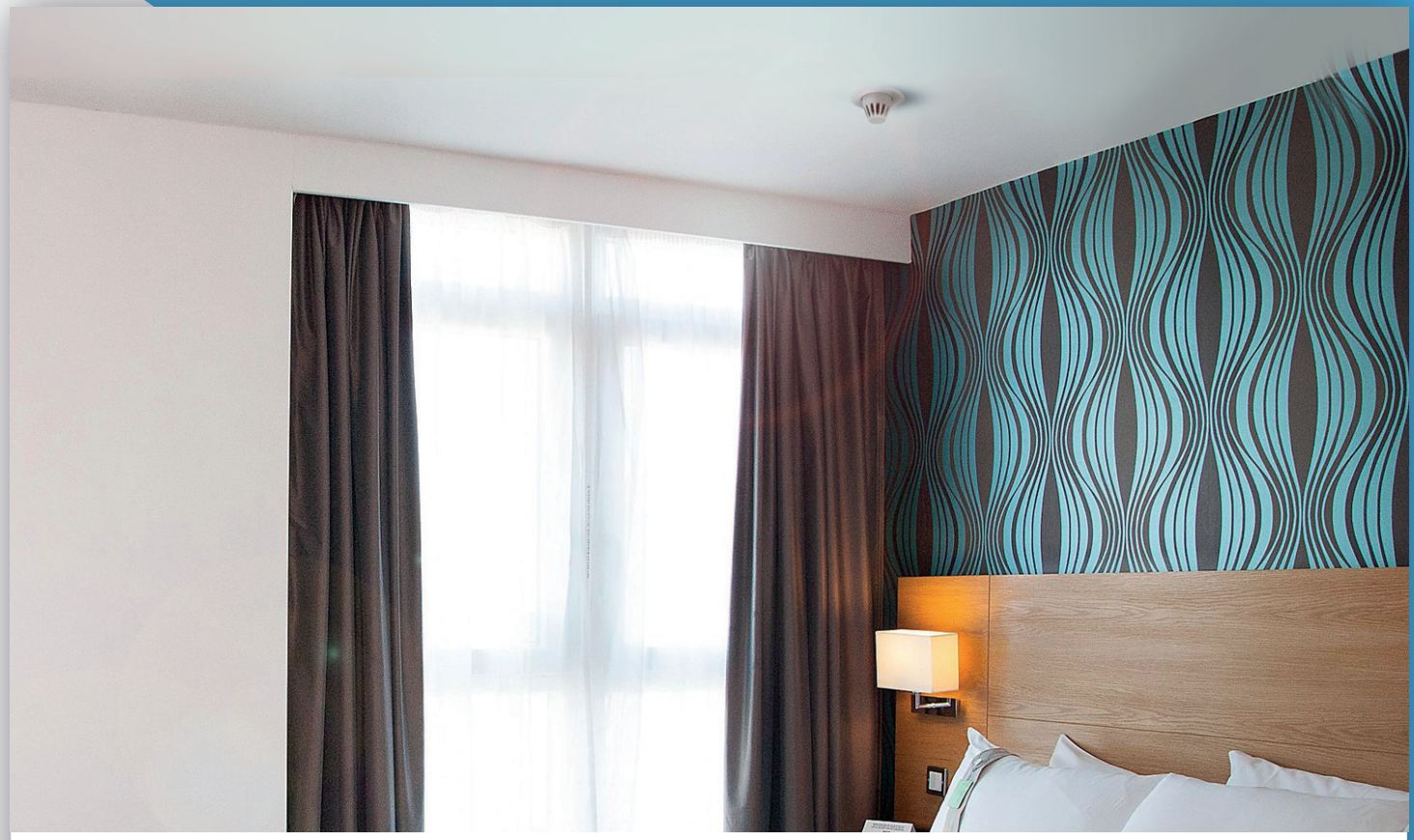
Introducing the DM Range

Contact: sales@dualmist.com Tel: +44 115 8500306

We are looking for distributors or installers around the world to promote our highly successful proprietary Low Pressure Watermist Fire Suppression System in their country or region.
If you are interested, then please contact us.

QS-DIOM01 Issue 2 23/8/2021

Contents



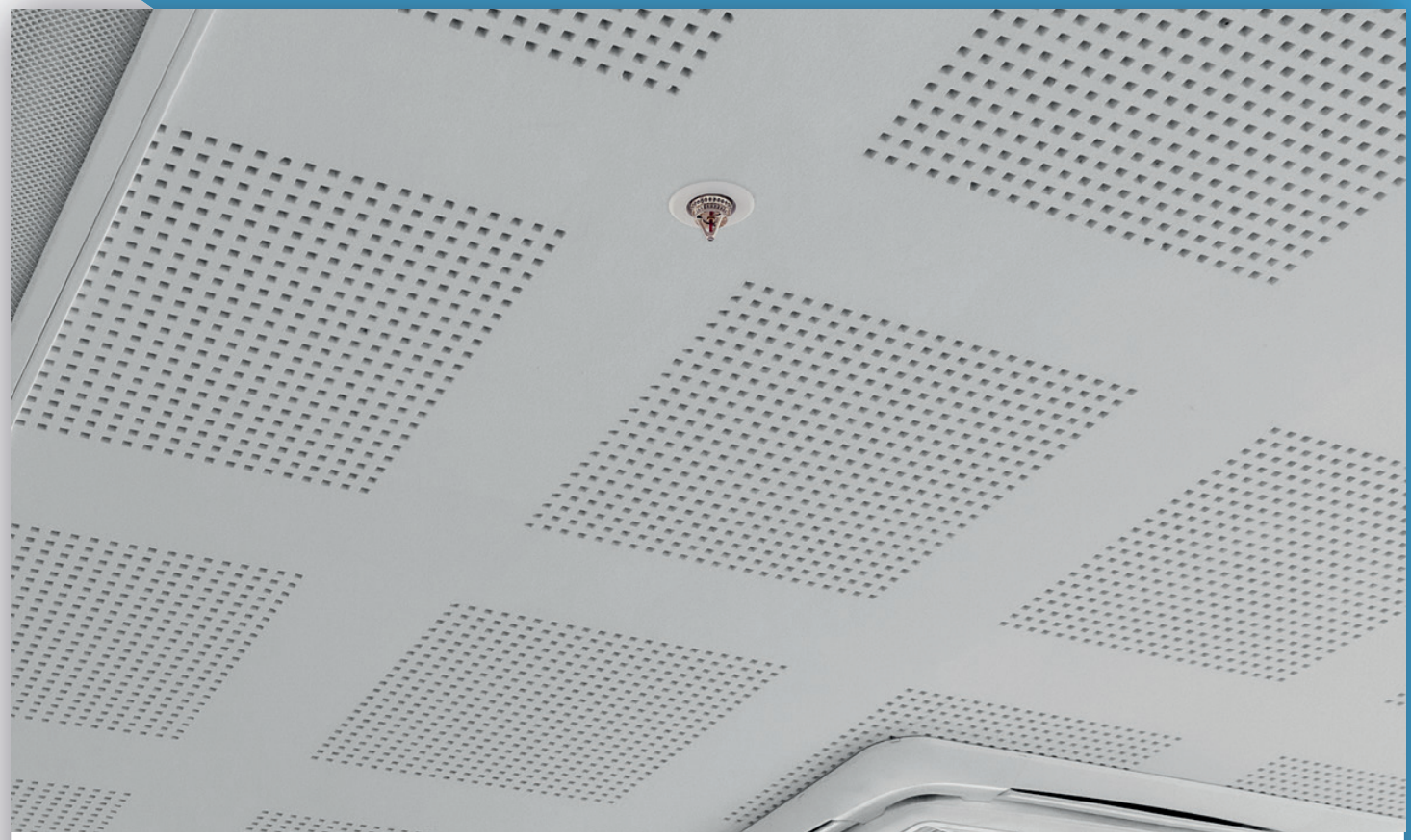
1. Introduction

The following pages relate to the design and installation of the DualMIST system.

The referred system is a fixed fire protection system, comprising components, water supply delivery and water atomisation. The system discharges a combination of fine and coarse water droplets through the nozzles ports.

Our misting systems and nozzles have been through a rigorous regime of independent fire and component testing at BRE Global and achieved various wateriest standards. Several of our products have a full LPCB Approval - an internationally recognised standard.

All nozzles are manufactured under stringent FPC controls and UKAS approved ISO 9001:2015



2. System Description

The DualMIST system is a fixed fire protection system, designed to operate by the control of heat detection.

The system by design utilises water to control, suppress or extinguish a fire and comprises an arrangement of nozzles attached to a series of pipework, which is in turn connected to a water supply and delivery pump(s).

Upon operation, the system discharges a combination of fine and coarse water droplets to the affected zoned area. This unique design concept of discharge affords greater cooling of the fire and increased coverage of surface area, by such utilisation of droplet configuration.

The system should be designed to operate effectively and consistently, for a period of discharge sufficient for the protection of fire risk, for the sufficient time objective, as to comply with the requirements of the project specification. It is therefore of fundamental importance that the systems design is able to maintain the correct flow and pressure characteristics at the nozzle(s) for a sufficient time.

The appropriate placement of nozzles is of equal importance thus to ensure full coverage of the space with minimal water wastage due to collision of spray with obstructions.

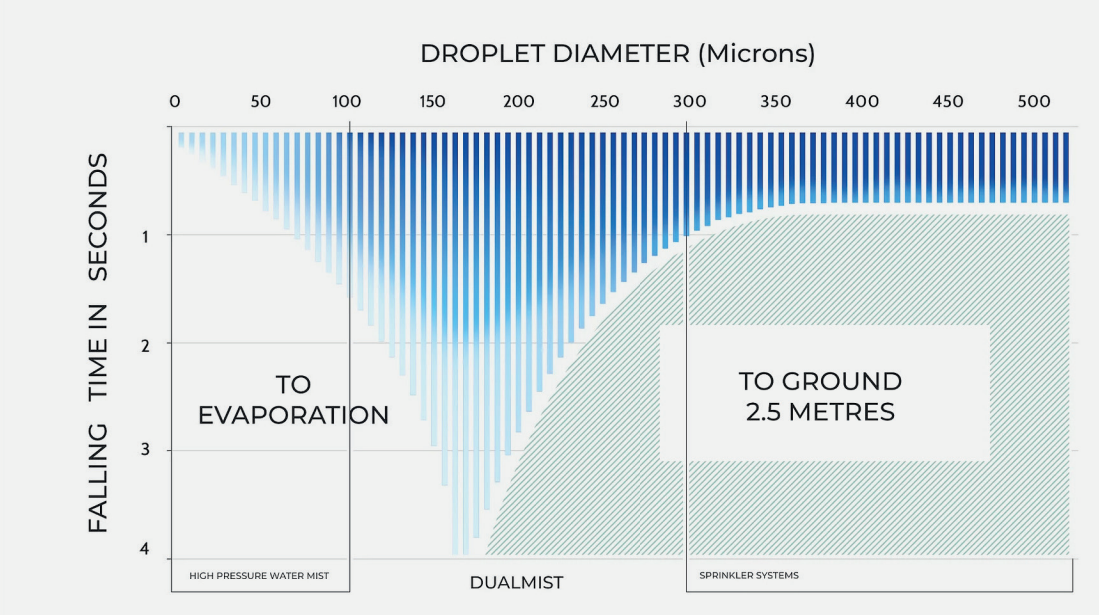
3. How The DualMIST Nozzles Works

The key to understanding the beauty of how the Dualmist System works and also how low pressure watermist works in general is to try to understand the why the droplet size range is so important.

In the chart below you can see that the range of droplet sizes produced by the Dualmist System is in between that of sprinklers and high pressure systems.

With high pressure systems - a very fine mist/aerosol is produced which is very effective at heat suppression but not so good at high ceiling heights or in open areas as side draft can cause the vapor to be swept sideways away from the fire. With high pressure systems there is little surface wetting due to the droplets evaporating before they reach the fire or nearby heated surfaces.

Conversely with sprinkler systems there is a huge amount of surface wetting but very little heat suppression as there is very little mist produced and little to stop the heat spreading across the ceiling cavity by convection which is where most of the heat from the fire ends up. With sprinklers there is also no mechanism to stop heat transfer across the room from radiating burning/hot objects and even worse with sprinklers most of the water quickly ends up on the floor and is then effectively useless from a suppression point of view. The length of time the the water droplets spend in the air is a critical factor in heat suppression. Please take a moment to study the below chart as it is of critical importance in terms of understanding how the system works.



As shown, the dualmist system produces the range of droplet sizes in between both.

This means the system produces both mist for heat suppression and coarser droplets for surface and wall wetting. Some of these larger droplets spray high up onto the walls and then run down the walls keeping them cool. They also have the benefit of helping to distribute the smaller droplets away from the nozzle head. The fine droplets stay airborn for a prolonged period of time until most eventually evaporate and expand into inert gas (water vapor) displacing the air in the room and thus reducing the percent oxygen levels which in turn reduces the overall burn rate of the fire. The dualmist nozzles use a combination of all the above methods to suppress the fire.

As you can see for a 2.5 height room there is an optimum range of droplet size to produce both effects. For higher height rooms the optimum range droplet size moves upwards accordingly.

4. Design Objective

The objective of this document is to ensure the implementation of an effective and compliant design of the DualMIST system. The content herein is intended for use by specifiers, installers and users in the selection, design, installation and inspection of the said system.

It is vital that the information herein be studied carefully thus to ensure the correct performance of DualMIST, given the critical nature of the systems integration into such premises vide the protection of property and/or life safety requirements of fire protection systems.

The following standardised documents have been taken into consideration during the development of this guidance document: -

- BS:8458 2015
- BS:8489 2016

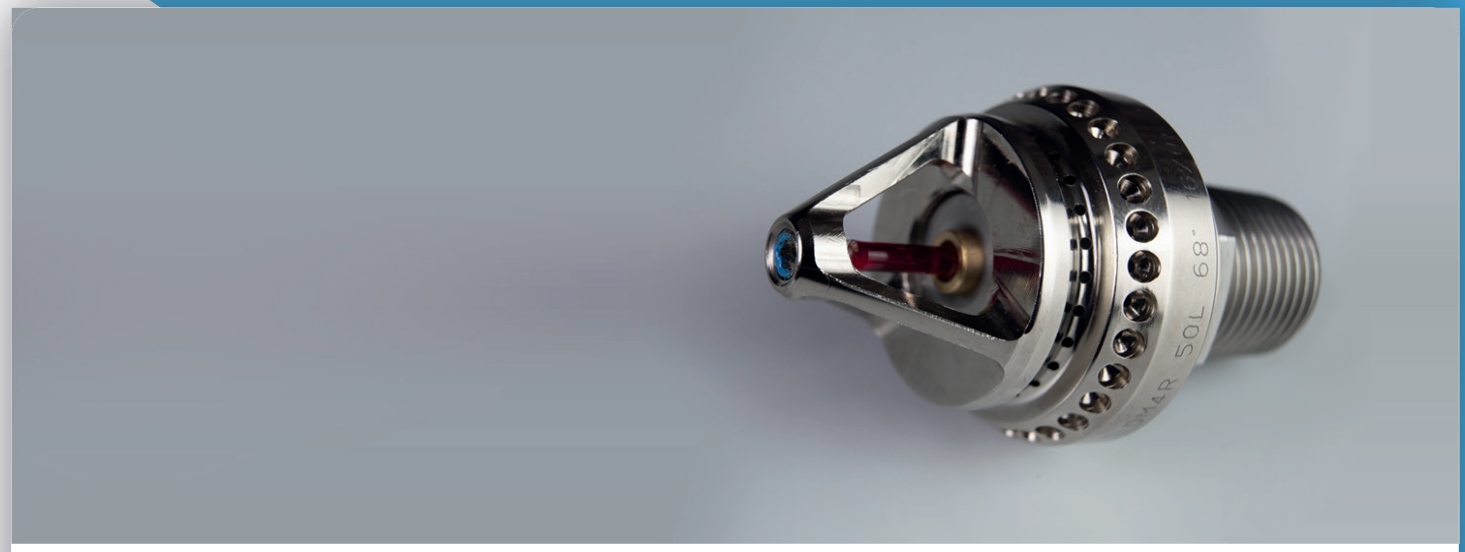
This guidance document has been developed to complement the above referred standards, not as a replacement and as such should be read in conjunction with the above. The above referred documents take precedence over this guidance document.

The first objective of design is to establish the criteria upon which the DualMIST system is specified for a specific area of risk or classifying the risk as domestic, residential or commercial. These include:

- Establishing the Area/Risk
- Fire Control Mechanisms
- Fire Control Objective
- Duration of Protection

4.1 Establishing the Area/Risk

The key objective of any project/building review is to ascertain the areas of which require fire protection, and/or to make due recommendations (as appropriate) to the same, whereupon it is perceived a fire risk may have been overlooked by the client, or clients representative.



A thorough appraisal of drawings and site specific specifications should be undertaken by a competent design engineer, in order that sectional and basic floor arrangements are considered establishing ceiling heights and room dimensions. The engineer should also assess the potential of generic hazards, such as electricity (protection requirements in switch gear) working heights (atriums), refuse and/or heavily cluttered areas with a significantly higher risk of ignition and fire load.

The category of system should be selected initially using table 1 of BS8458:2015 for domestic and residential applications and Annex A of BS:EN12845 table A.2 for commercial typical hazards.

The assumed maximum area of operation (AMAO) should be in line with the requirements of the category of system chosen or agreed otherwise by the authority having jurisdiction.

The category chosen and AMAO should always be documented in formalised communication with the client and/or the client's representative, prior to contract commencement.

4.2 Fire Control Mechanisms

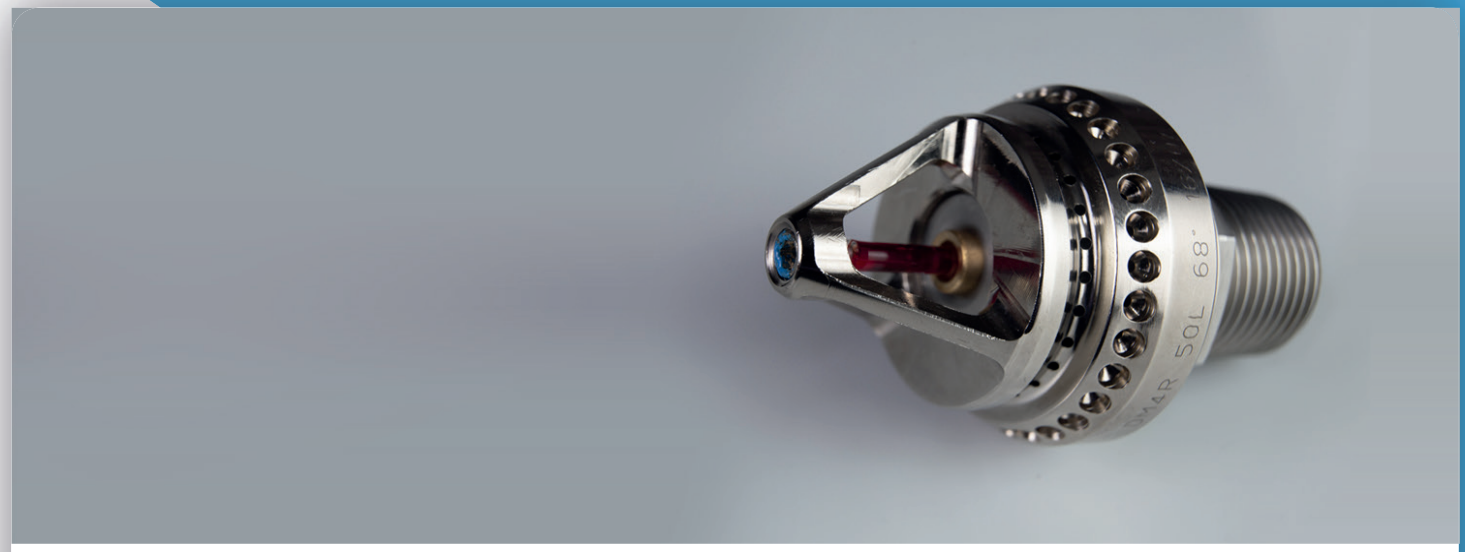
The objective of the design is to ensure that the most effective means of fire control be implemented into each specific area, within any respective building.

The system is ordinarily designed and implemented to buildings, whereupon fire is controlled by an arrangement of heat sensitive nozzles strategically placed to all areas that require fire protection. In this scenario and in the event of a fire, a heat sensitive fast response frangible bulb is used to activate the system. The detected nozzle often nearest to the fire is affected by heat and water mist is expelled to a localized area. It is a condition of the design and control objective that limitations on heat sensitive applications be restricted by ceiling height.

4.3 Fire Control Objective

The fire control objective for the DualMIST water mist system can be:

- Fire extinguishment. A sharp reduction in heat release rate leading to complete elimination of any flaming or smouldering fire or;
- Fire suppression/control. A steady reduction in the heat release rate resulting in a lower controlled level of burning/limitation of fire growth and protection of structure (by cooling of the objects, fire gases and/or by pre-wetting adjacent combustibles).



The fire control design objective for the DualMIST water mist system should be established and formalised upon design submission. DualMIST have and continue to proof test their products to both standardised fire test protocol and bespoke fire testing for specific applications. Such testing gives assurance of product safety to both DualMIST and clients.

4.4 Duration of Protection

The operating duration of the DualMIST system should be in accordance with the appropriate standard:

- BS: 8458 2015 (6.7)
  Domestic - 10 minutes
  Residential - 30 minutes

- BS: 8489-1 2016 (6.2.1-d-2)
  Commercial – 60 minutes

It is often the case that limitations within building structures and external areas place restriction on the extent of water capacity. In this premise it is the objective to ensure that the DualMIST system operates for a duration that is acceptable to the client and the authority having jurisdiction such as the fire officer or building control officer, and that appropriate measures are in place to ensure the rates of infill are sufficient to meet the applicable standard.

The design objective for system duration should always be documented in formalised communication with the client and/or the client's representative, prior to contract commencement. The calculation of water required to ensure the appropriate operation of the system is always derived from the most favourable assumed maximum area of operation.

5. Design Parameters

There are several critical factors to consider in the implementation of design, such as the coordination of third party services including inter-alia lighting and the provision of ductwork. Interfacing with such equipment must not in any way compromise the critical parameters of design that are pre-requisite of DualMIST in regard to performance vide the appropriate placement of nozzles.

It is imperative that design considerations take due cognisance of the following provisions:

5.1 Nozzle Selection

The selection of nozzles should be in accordance with this guidance document and should meet at least the established parameters herein.

a) Type / Nozzle Orientation / Temperature Rating

Reference	Type	Nozzle Orientation	Temperature
 DM3	High level areas either Residential or Commercial.	Pendant	Deluge No Bulb
 DM4R	Domestic, Residential*	Pendant	68°C
 DM4C	Commercial	Pendant	57°C
 DM5	Residential and Light Commercial use such as hotel bedroom bulkheads	Sidewall	57°C / 68°C

*Please note BS 8458:2015 Table 3 maximum room size of 80m²

b) Maximum Height

Reference	Maximum Height Floor to Ceiling of Protected Room / Area
 DM3	7000mm
 DM4R	3500mm
 DM4C	5500mm
 DM5	3500mm

c) Minimum and Maximum Distance Between Nozzles

Reference	Minimum Distance Between Nozzles	Maximum Distance Between Nozzles
 DM3	2000mm	5500mm
 DM4R	2000mm	5000mm
 DM4C	2000mm	4000mm
 DM5	2000mm	5000mm / 5000mm horizontal throw

d) Minimum and Maximum Distances from Walls / Boundaries

Reference	Minimum Distance From Walls	Maximum Distance From Walls
 DM3	150mm	2750mm
 DM4R	150mm	2500mm
 DM4C	150mm	2000mm
 DM5	150mm	2500mm

e) Positioning of Nozzles with Regard to Soffit

Reference	Maximum Position of Nozzle below Combustible Soffit	Maximum Position of Nozzle below Non Combustible Soffit
 DM3	Optimal – 150mm Maximum – Risk Access	Optimal – 150mm Maximum – Risk Assess
 DM4R	Optimal – 150mm Maximum – 300mm	Optimal – 150mm Maximum – 450mm
 DM4C	Optimal – 150mm Maximum – 300mm	Optimal – 150mm Maximum – 450mm
 DM5	Optimal – 150mm Maximum – 300mm	Optimal – 150mm Maximum – 300mm

f) Maximum Distances from Columns

Reference	If nozzles are installed closer than 600mm from one side of a column, another nozzle shall be installed on the opposite side of the column within:
 DM3	2750mm
 DM4R	2500mm
 DM4C	2000mm
 DM5	2500mm

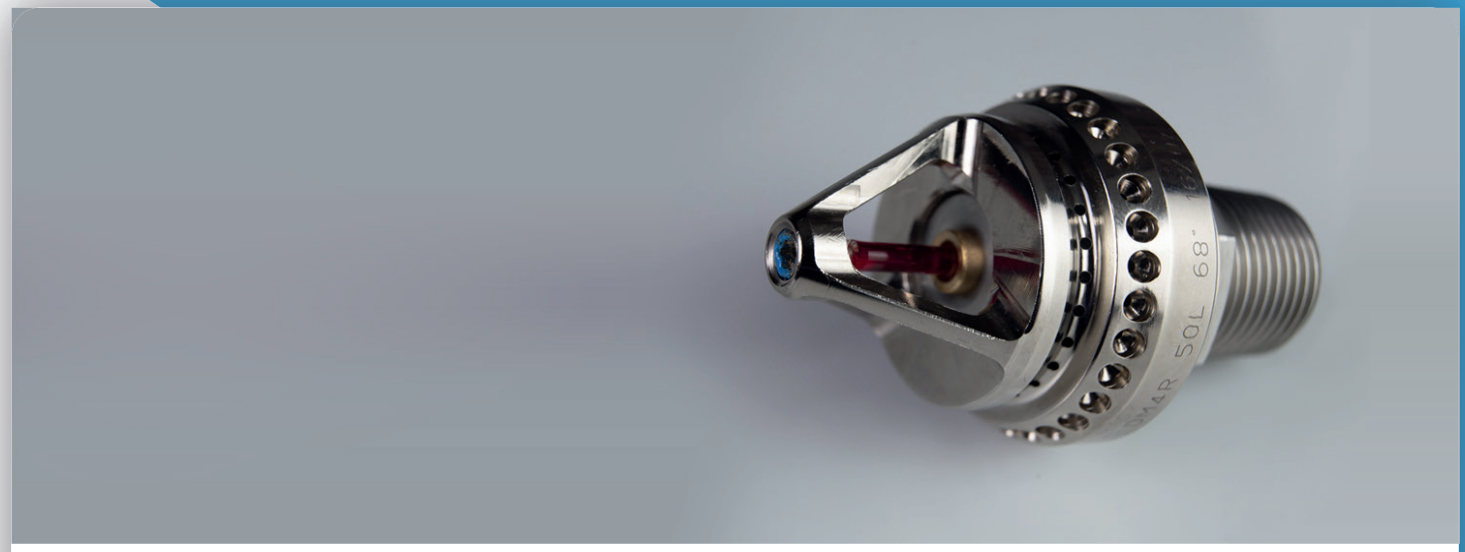
g) Minimum Flow Rates , Pressure & K Factor

Reference	Minimum Flow Rate	Minimum Pressure	K Factor
 DM3	65 LPM	5 Bar	29
 DM4R	50 LPM	5 Bar	22
 DM4C	60 LPM	5 Bar	27
 DM5	50 LPM	6 Bar	20

h) Location of Nozzles with Regard to Obstructions

Reference	Obstruction depth (depth from nozzles highest port to below obstruction)								
	100mm	200mm	300mm	400mm	500mm	600mm	700mm	800mm	>800mm
 DM3	200mm	400mm	800mm	1100mm	1400mm	1600mm	1900mm	2000mm	*
 DM4R	600mm	1200mm	1600mm	1800mm	2000mm	*	*	*	*
 DM4C	100mm	150mm	650mm	900mm	1100mm	1300mm	1500mm	1800mm	200mm
 DM5	200mm	400mm	*	*	*	*	*	*	*

*Maximum obstruction depth reached, nozzle should be spaced no greater than the maximum distance from boundary / walls detailed in table d)



i) Sloping Ceilings / Soffits

Nozzles should be installed parallel to the slope of the roof or ceiling. Where the slope is greater than 30° to the horizontal plane, a row of nozzles shall be fixed at the apex or not more than 600mm radically from it.

j) Bulkheads / Platforms / Ducting...

Nozzles shall be installed under bulkheads, platforms, ducts, heating panels, galleries, walkways etc which are:

a) Rectangular, more than 800mm wide and less than 150mm from adjacent walls or partitions.

b) Rectangular and more than 1000mm wide.

c) Circular, more than 1000mm in diameter and less than 150mm from adjacent walls or partitions.

d) Circular and more than 1200mm in diameter.

5.2 Pressure loss

System pipework should be hydraulically designed to deliver the required water flow in accordance with the manufacturers guidance, verification of each project must be determined by the appropriate utilisation of industry recognised hydraulic calculation procedure – such as the ''Hazen Williams' formula for liquid flow systems and hydraulic software such as Canute FHC.

5.3 System Venting

Venting valves should be provided where it is considered that excessive air accumulation in water filled pipework could detrimentally affect the performance of the system.

5.4 Installation

The installation of pipework should be implemented by competent and approved trades' personnel. Consideration should be given to the positioning and placement of pipework services thus that the same is not exposed to damage such as fire, passing vehicles, cold weather conditions and contact with dissimilar metals.

5.5 Supporting of Pipework

Pipe supports should either be in accordance with ISO 6182-11 or have at least equivalent performance in terms of load, vibration and heat resistance. They should be suitable for the environmental conditions and for the expected temperature, including the stresses induced in the pipe work by temperature variations, and should be able to withstand the anticipated dynamic and static forces. Pipe supports should be designed and spaced according to the manufacturers design and installation manual, but with spacing no greater than the intervals given in Table 2, 3 & 4 below for the appropriate type of pipework. Pipe supports should be located not more than 300mm either side of any fitting or connection.

Table 2: Maximum Spacing of Fixings for Copper and Stainless Steel Pipework

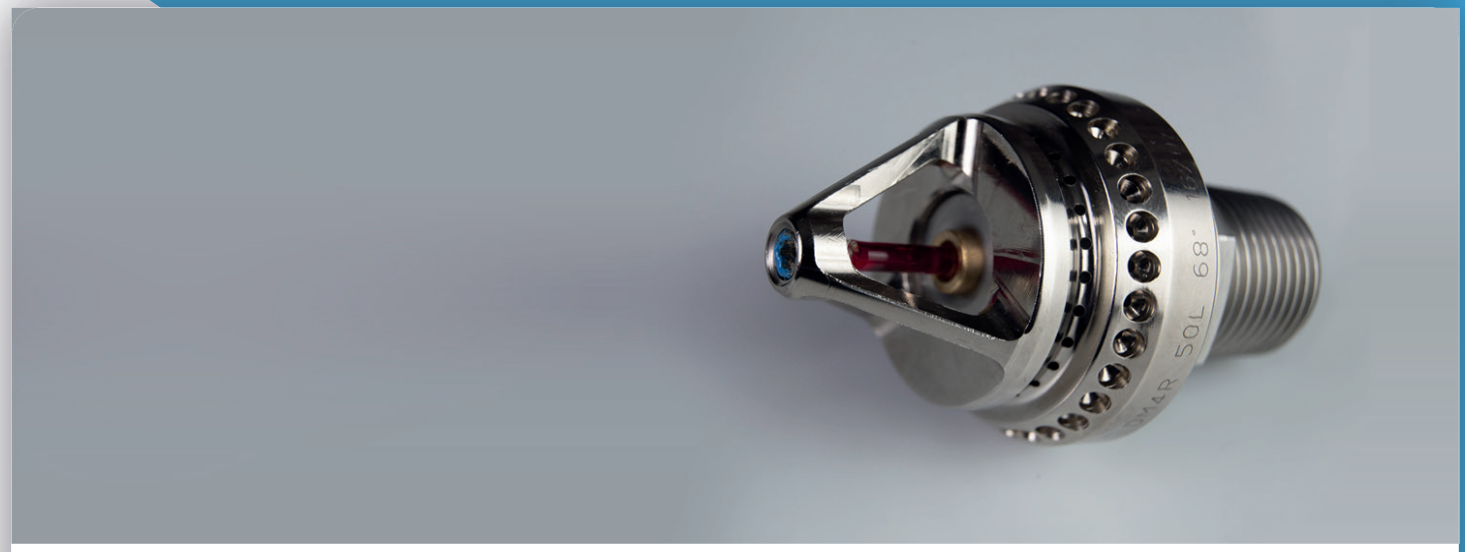
Nominal Diameter (mm)	Horizontal Run (m)	Vertical Run (m)
12	1.2	1.8
16	1.5	2.1
22	1.8	2.4
28	1.8	2.4
35	2.4	3.0
42	2.4	3.0
54	2.7	3.0

Table 3: Maximum Spacing of Fixings for Steel Pipework

Nominal Diameter (mm)	Horizontal Run (m)	Vertical Run (m)
15	1.8	2.4
20	2.4	3.0
25	2.4	3.0
32	2.7	3.0
40	3.0	3.6
50	3.0	3.6
80	3.6	4.5

Table 4: Maximum Spacing of Fixings for CPVC Pipework

Nominal Diameter (mm)	Horizontal Run (m)	Vertical Run (m)
12	1.2	3.05
15	1.6	3.05
22	1.7	3.05
28	1.8	3.05
32	2.0	3.05
40	2.1	3.05
50	2.4	3.05



5.6 Pump(s)

All pump sets are to be manufactured bespoke to a required project taking cognisance of the minimum volume output and the pressure ratings required for the appropriate distribution of water to the systems proprietary nozzles. The pump(s) should be supplied by a recognised provider of such equipment and the integrity of its electrical controls should meet the design objective of the DualMIST system.

A pump set includes a duty pump set with jockey pump capabilities or a duty pump set with an independent jockey pump which maintains system pressure due to minor fluctuations in pressure, a standby pump may be required dependent upon the dictates of a specific project, whereupon a superior supply is required vide the provisions of enhancements and/or the conditions of any given project.

The pump rating requirement is given by hydraulic calculation of the most remote nozzles, a permanent flow meter and pressure gauge should be installed at the pump location to enable the pump duties to be verified.

5.7 Tanks/Water Storage

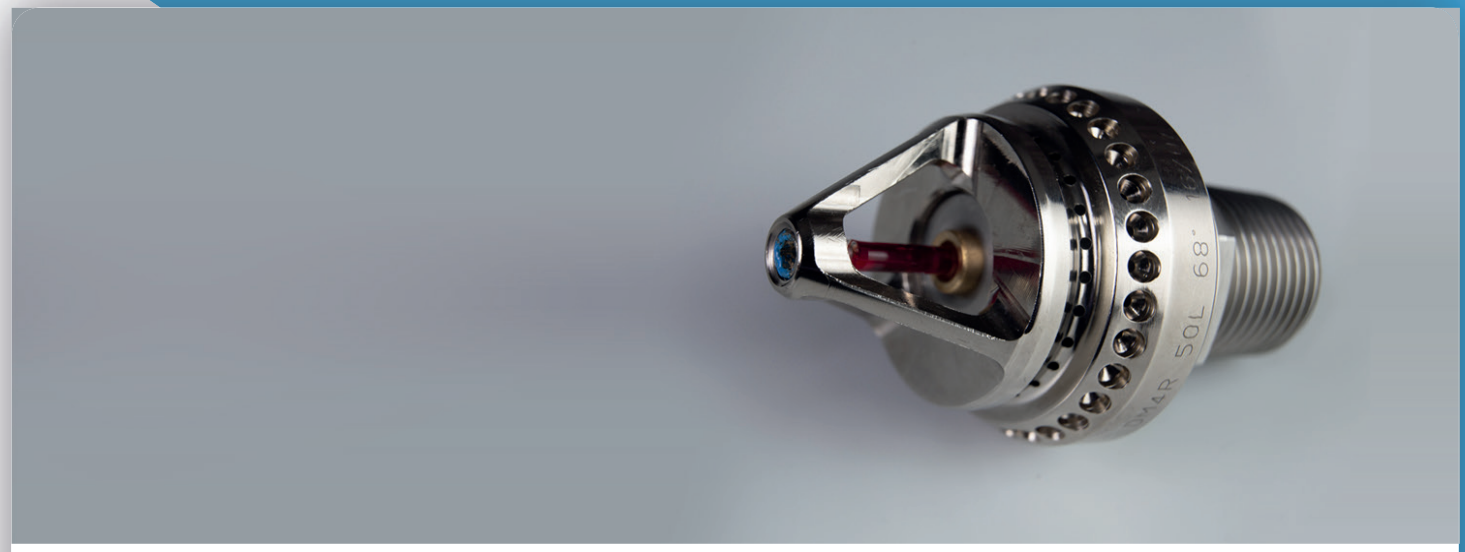
The DualMIST system is normally supplied via a water storage tank of GRP construction, and of approved type and quality. Stainless steel construction tanks of 316 type is acceptable but not preferred.

Each tank must include the following as a minimum:

- Vortex Inhibitor
- Ball float valve / Tank infill isolation valve
- Low water level switch
- Overflow / Tell Tale / Drain Valve
- Suction & Pump test return connection

5.8 Housing of Equipment

Water supply equipment, such as pump(s), water storage tank(s), should not be housed in buildings or sections of premises in which there are hazardous processes or explosion hazards. The water supplies, stop valves and control equipment should be installed such that they are safely accessible even in a fire situation.



5.9 Supply of Electricity

The supply to the pump controller should be solely for use of the pump set and separate from all other connections. Where permitted by the electrical utility, the electrical supply to the pump controller should be taken from the input side of the main switch on the incoming supply to the premises.

5.10 Supply of Water

The DualMIST system is normally provided as a standalone solution, however it is a mandatory requirement that sufficient infill rates be provided to satisfy the requirements of the respective project. All water supplies to the system should be independent and the risk of isolation must be prevented by lockable inline valves. Infill supplies should be adequately demonstrated as suitable to meet the requirements of the systems design objective.

5.11 Valves

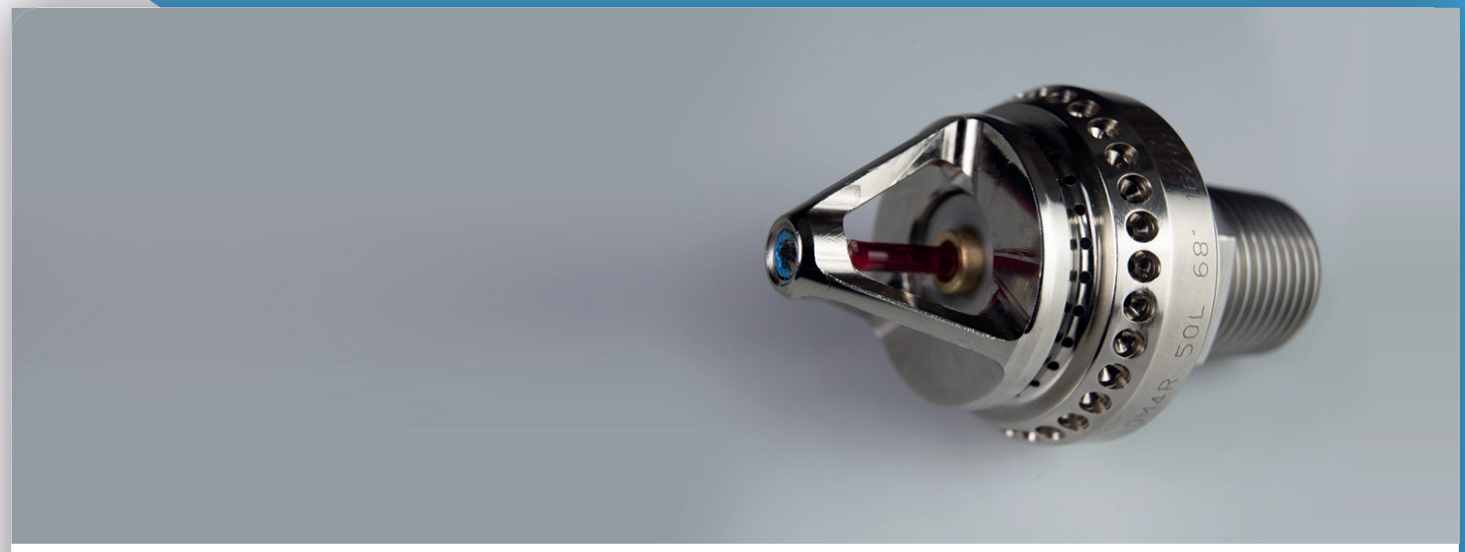
All valves installed inline must be of a lockable type and be of an approved make and quality. Valves installed as an access point to the system should be at least plugged or capped thus to prevent accidental drainage of the system.

5.12 Strainers

Strainers should be made of corrosion-resistant materials. For pressure-bearing parts and for the sieve, metallic materials should be used. The flow direction should be given on the body of system strainers. System strainers should be installed in all water supply connections. It should be possible to take out the sieve and the dirt particles of system strainers without having to remove the strainer housing.

All parts should be constructed in such a way that incorrect mounting will be obvious. Strainers should be designed in such a way that spheres with a diameter of more than 0.8 times the minimum nozzle waterway dimension cannot pass through the strainer.

The free flow through the distribution pipes should not be obstructed, i.e. no part of the strainer should protrude into that pipe waterway.



If the nozzle strainer is projecting from the nozzle inlet into the pipe fitting, the design should be such that a sphere with a diameter of 3mm can pass between the inner surface of the pipe fitting and the outer surface of the strainer.

5.13 Drainage

The system should be installed in such a way that the entire pipework can be drained. The drain point(s) should be of lockable type and plugged.

5.14 Remote Test Valve

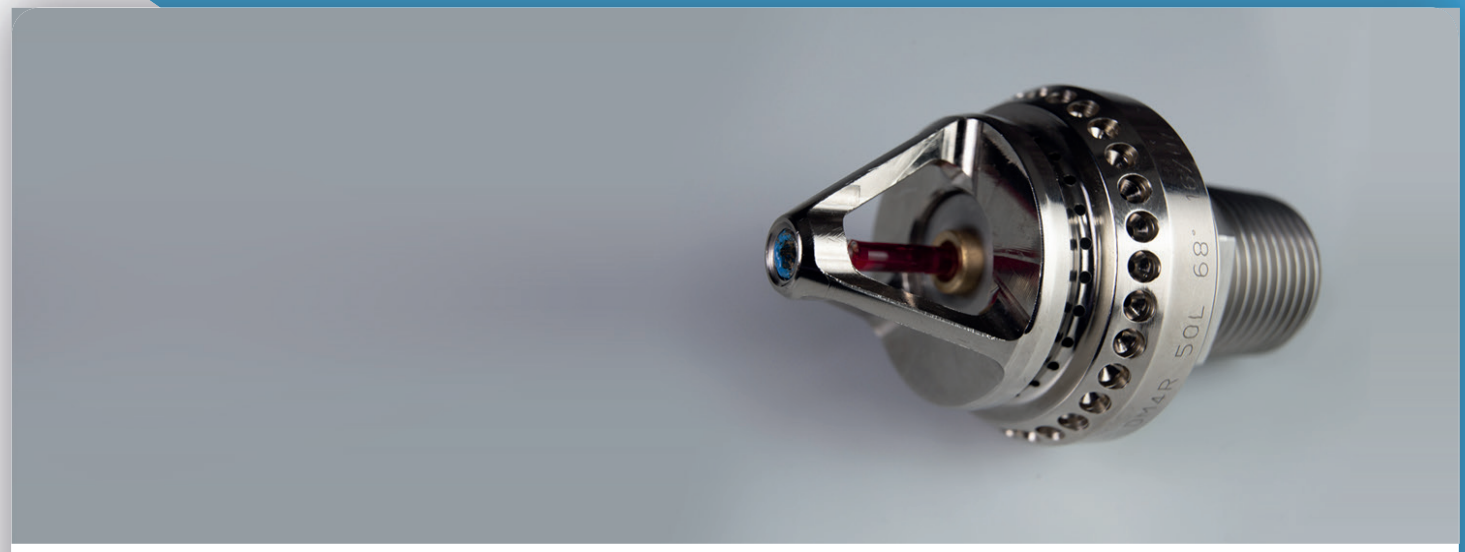
A remote test valve should be installed at the most remote distribution pipe of the system per zone / floor level.

5.15 Flushing Connection

Flushing connections, with or without permanently installed valves, shall be fitted on the spur ends of installation distribution pipes.

5.16 Frost Protection

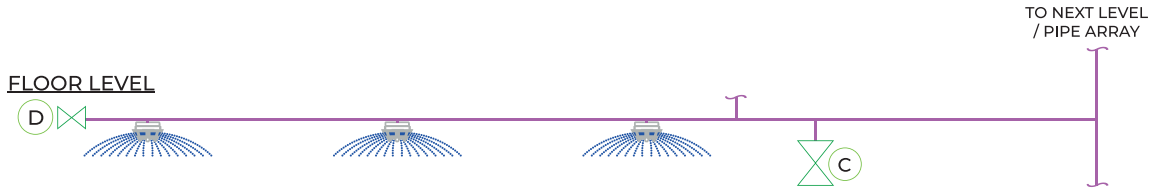
All aspects of the DualMIST system should be appropriately protected against the risk of frost and/or the implications of cold/freezing weather conditions. Advice should be given to the client regarding this fundamental provision of system protection thus by ensuring that all areas of a building containing DualMIST services be maintained to a minimum temperature of 4oc.



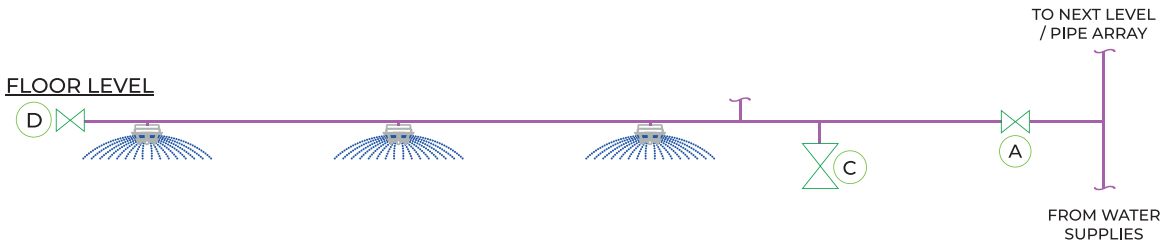
6. Typical System Schematics

6.1 Typical Nozzle / Pipe Arrangements

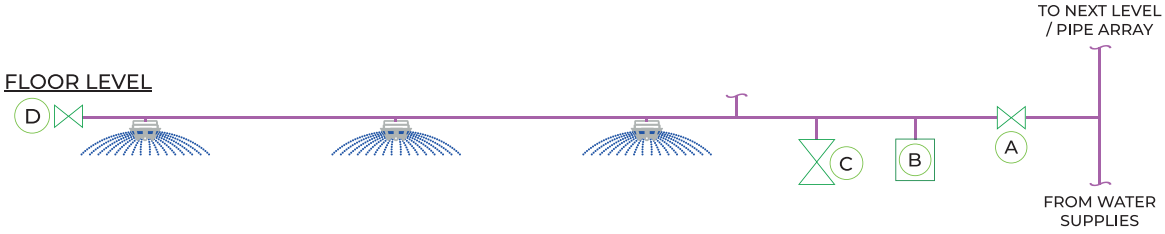
6.1.1 Standard Arrangement



6.1.2 Isolation Arrangement



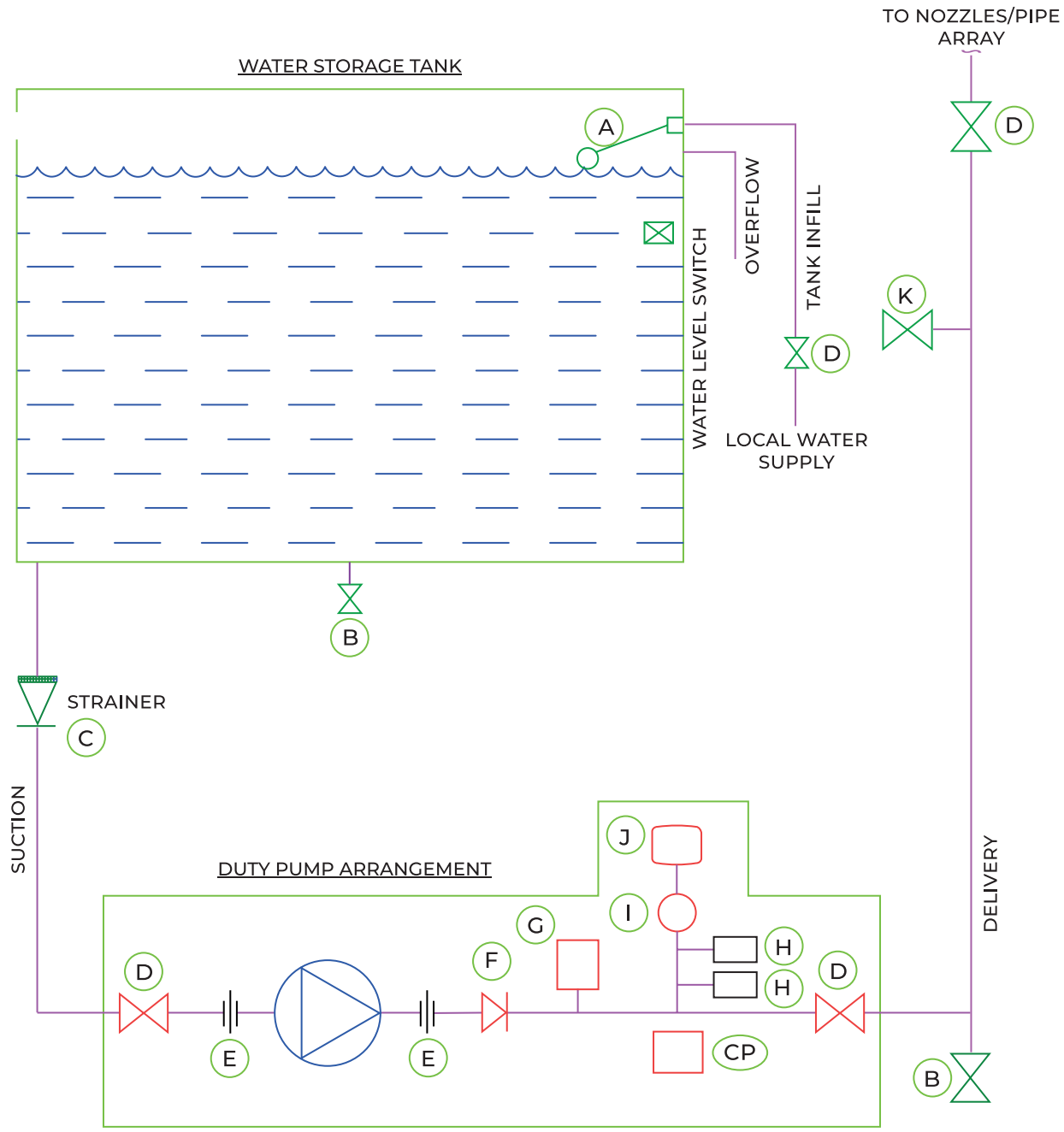
6.1.3 Zone Flow Isolation Arrangement



A	Isolation Valve	C	Drain Valve
B	Flow Switch	D	Remote Test Valve

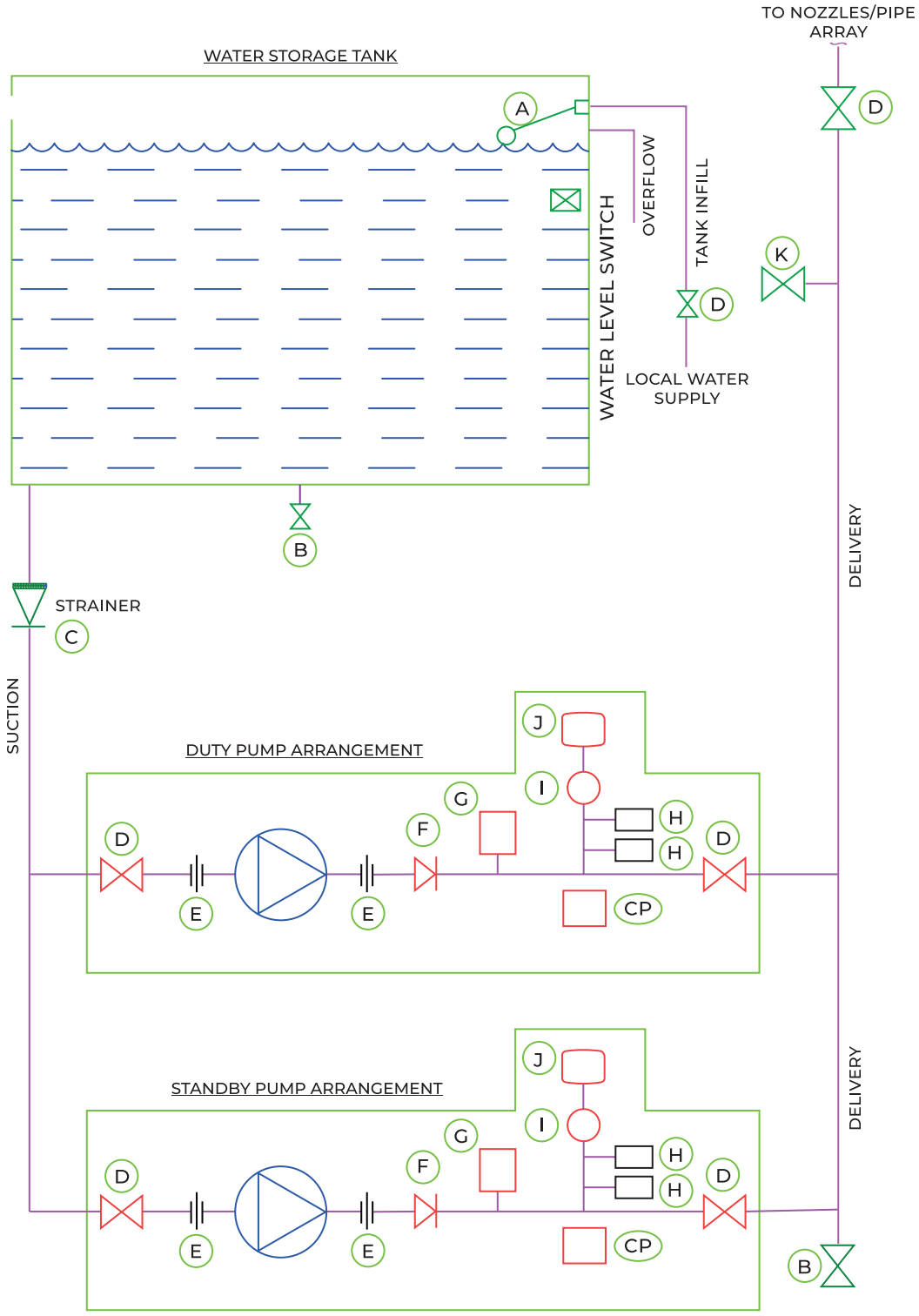
6.2 Typical Water Supply Arrangements

6.2.1 Standard Positive Head Pump with Jockey Pump Capabilities / Tank Arrangement



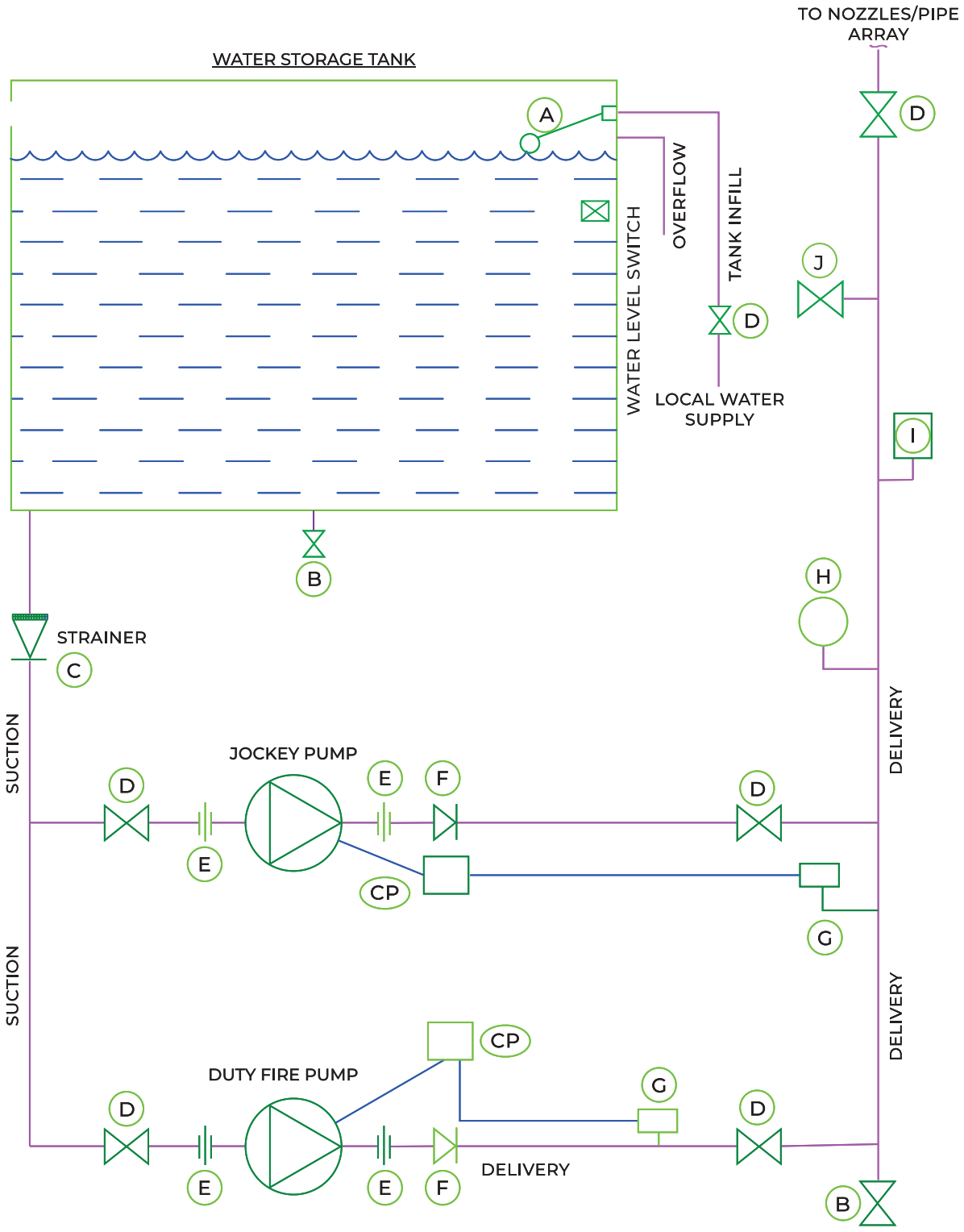
A	Ball Float Valve	E	Union	I	Pressure Gauge
B	Drain Valve	F	None Return Valve	J	Accumulator
C	Strainer	G	Flow Switch	K	Flow Test Connection
D	Isolation Valve	H	Pressure Switch		

6.2.2 Duplicate Positive Head Pump sets with Jockey Pump Capabilities / Tank Arrangement



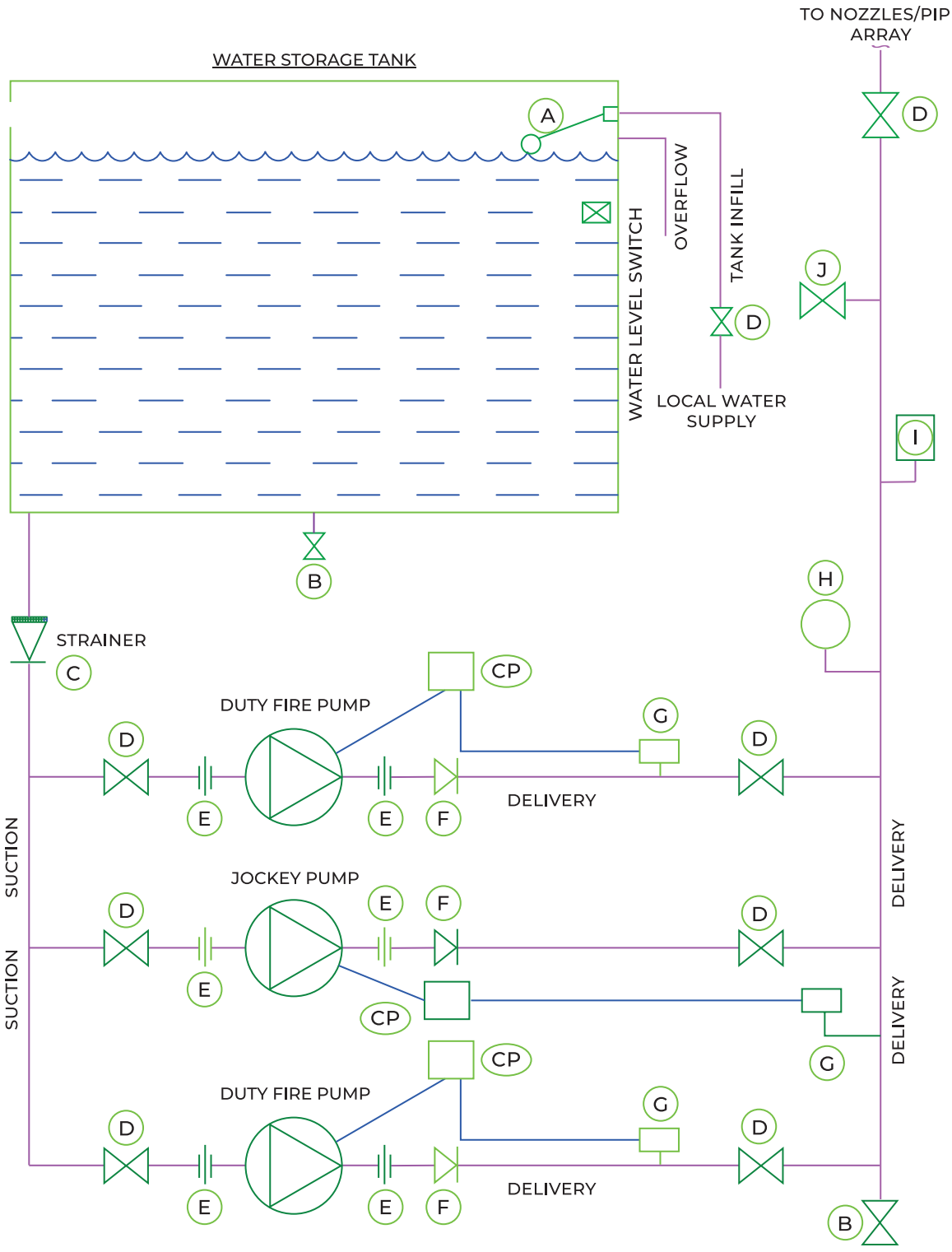
A	Ball Float Valve	E	Union	I	Pressure Gauge
B	Drain Valve	F	None Return Valve	J	Accumulator
C	Strainer	G	Flow Switch	K	Flow Test Connection
D	Isolation Valve	H	Pressure Switch		

6.2.3 Standard Positive Head Pump set / Independent Jockey Pump / Tank Arrangement



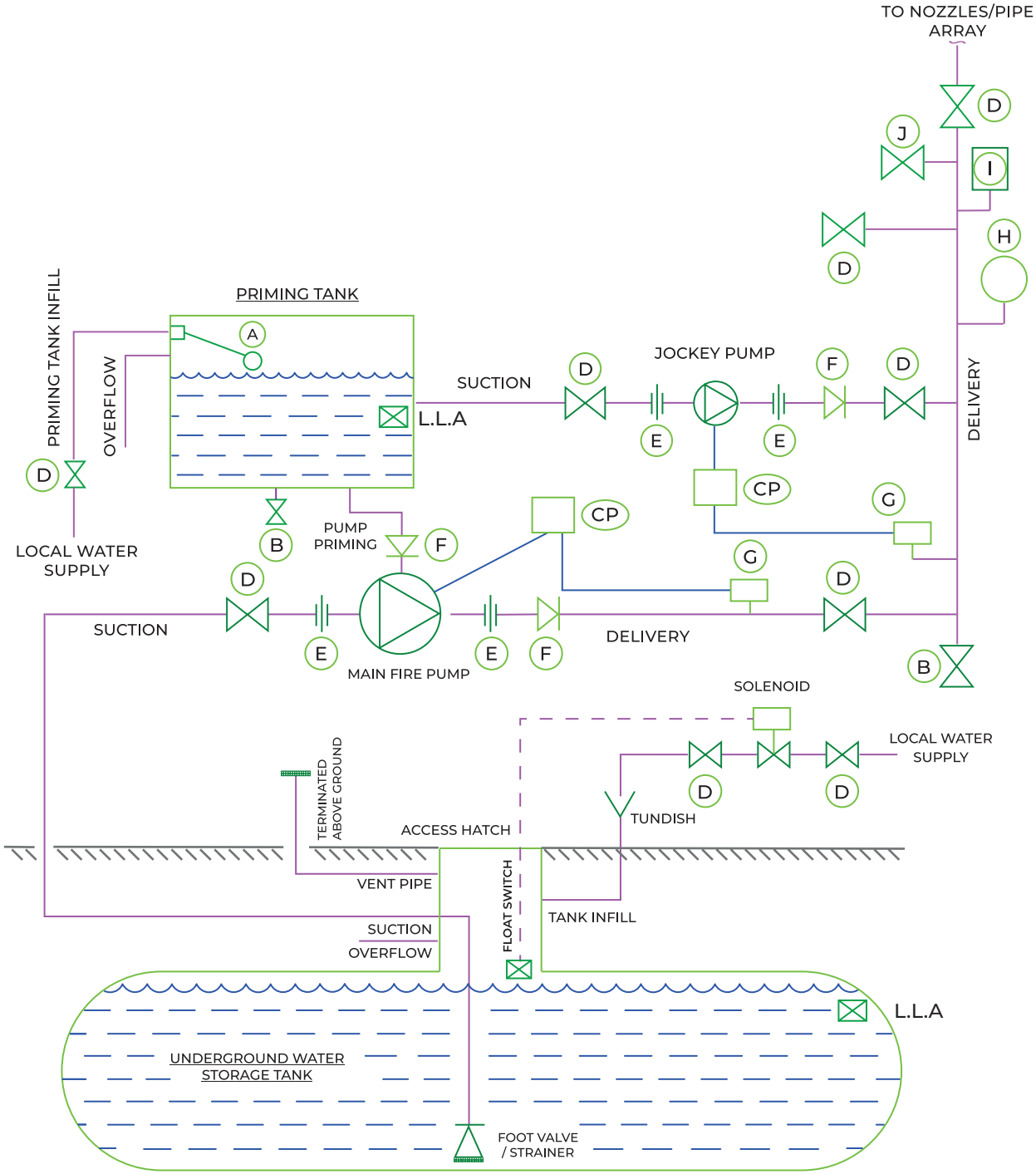
A	Ball Float Valve	E	Union	I	Flow Switch
B	Drain Valve	F	None Return Valve	J	Flow Test Connection
C	Strainer	G	Pressure Switch		
D	Isolation Valve	H	Pressure Gauge		

6.2.4 Duplicate Positive Head Pump set / Independent Jockey Pump / Tank Arrangement



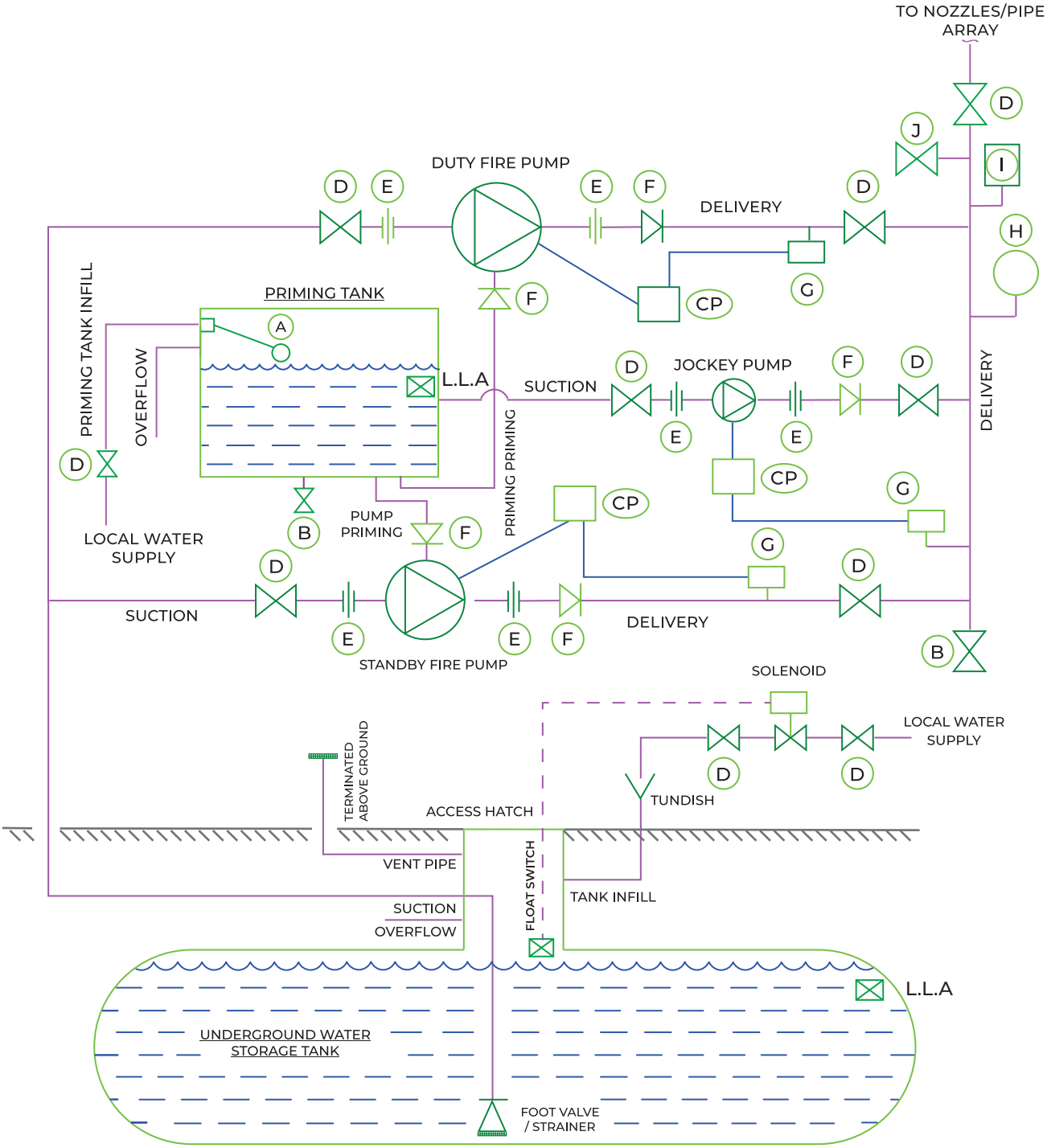
A	Ball Float Valve	E	Union	I	Flow Switch
B	Drain Valve	F	None Return Valve	J	Flow Test Connection
C	Strainer	G	Pressure Switch		
D	Isolation Valve	H	Pressure Gauge		

6.2.5 Standard Suction Pump set / Tank Arrangement



A	Ball Float Valve	E	Union	I	Flow Switch
B	Drain Valve	F	None Return Valve	J	Flow Test Connection
C	Foot Valve with Strainer	G	Pressure Switch		
D	Isolation Valve	H	Pressure Gauge		

6.2.6 Duplicate Suction Pump set / Tank Arrangement



A	Ball Float Valve	E	Union	I	Flow Switch
B	Drain Valve	F	None Return Valve	J	Flow Test Connection
C	Foot Valve with Strainer	G	Pressure Switch		
D	Isolation Valve	H	Pressure Gauge		

7. Commissioning & Maintenance

The DualMIST system should be commissioned by competent engineer/engineers who are capable of verifying the system from a mechanical and electrical perspective.

The system should be checked initially for soundness of design and compliance thereto, by thorough review of drawing's and specifications relative to the respective project. It is required that all areas be determined for validation on testing as to comply with the provisions of this document. Commissioning checks should comprise of a physical inspection of all areas together with contract drawings to enable the appropriate information pertaining to As- Built documentation.

All pipework should be hydrostatically tested for not less than 2 h, to a pressure of 1.5 times the maximum pressure to which the system will be subjected.

Any faults disclosed, such as permanent distortion, rupture or leakage, should be corrected and the test repeated.

Care should be taken not to subject any system components to pressure higher than those recommended by the supplier.

The DualMIST system should be maintained by competent engineers.