# MicroDrop® High Pressure Water Mist Specification Manual

a vital part of your world

tyco
Fire & Integrated Solutions

# MicroDrop® High Pressure Water Mist Technical Specification

## I N D E X

1. GENERAL

1.1 Description of Work
1.2 Applicable Standards
1.3 System Requirements
1.4 Submittals

2. SYSTEM COMPONENTS

2.1 High Pressure Water Mist (H.P.W.M.) Principle
2.2 System Description/Operation
2.3 Cylinder Systems
2.4 Pump Systems
2.5 Nozzles
2.6 Wall Cabinet
2.7 Pump Control Pane
2.8 AFFF additives
2.9 Detection Equipment

3. INSTALLATION

3.1 Pipework Specification
3.2 Pipework Installation

4. COMMISSIONING AND TESTING

5. SERVICE AND MAINTENANCE

# 1. GENERAL

## 1.1 Description of Work

Design and installation of an engineered high pressure water mist system as manufactured by Tyco Fire & Integrated Solutions, Tyco Park, Grimshaw Lane, Newton Heath, Manchester, M40 2WL.

Drawings.

The contract drawings indicate the general arrangements of the areas to receive detection and high pressure water mist protection. The Contractor is to review all drawings so that all items affecting the operation of the fire detection/high pressure water mist system (such as equipment location, air diffuser, damper closures and door openings) are considered in the design of the engineered system.

## 1.2 Applicable Standards

The following publications of the issues listed below (but referred to thereafter by basic designation only) form a part of this specification to the extent indicated by the reference thereto (latest edition).

**i) NFPA 750** - Standard on Water Mist Fire Protection Systems.

**ii) BS.5839 Part 1** - Fire Detection and Alarm System for Buildings.

**iii) IMO A800** - Standard for Equivalent Systems on Passenger Ships.

**iv) IMO MSC/Circ. 913** - Guidelines for the Approval of Fixed Water Based Local Application Fire Fighting Systems.

**v) IMO MSC/Circ. 668/728** - Alternative Arrangements for Halon Fire Extinguishing System in Machinery Spaces.

**vi) CEN/TS 14972** – Fixed Fire fighting Systems – Water Mist Systems – Design and Installation

## 1.3 Requirements

A) This Fire performance criteria of the system shall be designed and made in strict accordance with the applicable design standards of Tyco Fire & Integrated Solutions

B) The system shall be designed and installed by an L.P.C. accredited company to LPS 1204.

## 1.4 General

A) Provide all engineering design and materials for a complete fire detection/high pressure water mist suppression system, including storage cylinders, pump units, nozzles, pump control panel, detectors, wiring, annunciators, alarm panels and all other equipment necessary for a complete operational system.

B) Major system components will be produced by Tyco (no alternatives) and will be installed by Tyco Fire & Integrated Solutions.

### 1.5 Submittal

A) The following will be submitted for approval within 4 weeks of award, and prior to delivery of materials. Material and equipment information will include data sheets for each component or device used in the system. This will include, but not be limited to, the following

a) pump units
b) extinguishant control panel
c) detectors
d) release devices
e) alarm devices
f) high pressure water mist storage cylinders
g) mounting brackets
h) discharge nozzles
i) distribution pipework isometrics
j) computer flow calculations
k) electrical pump control panel

B) Provide information outlining the operation and maintenance procedures that will be required of the owner. This information will explain any special knowledge or tools the owner will be required to employ, and all spare parts that should be readily available.

C) Drawings will include location details and operation details of all equipment associated with the high pressure water mist system. Floor plans will be provided showing equipment locations, piping, point-to-point wiring and other details as required. Floor plans will be drawn to a scale of not less than 1.50. Elevations, cross sections and other details will be drawn to scale as required. Isometric pipe work layouts will be provided. In addition, point-to-point electrical layout drawing will be provided.

D) Sequence of operation, electrical schematics and connection diagrams will be provided to completely describe the operation of the high pressure water mist system controls.

## 2. SYSTEM COMPONENTS

### 2.1 Mist Extinguishant Principle

The water mist system will be capable of producing fine water droplets within the range of 60 - 100 micron size.

### 2.2 System Description and Operation

The high pressure water mist system will consist of a number of nozzles connected by stainless steel piping to a high pressure water source either stored pressure (cylinder units) or continuous pressure (pump units).

### 2.3 Cylinder Systems

Cylinders will be used as required by the system design, and consists of two types of cylinders. One will be filled with 80L of water at atmospheric pressure (water cylinders) and the other with 80L nitrogen only (nitrogen cylinders) pressurised to 200 bar. The output to the system will be regulated to constant 100 bar.

The cylinder unit will be activated by a valve which will only be placed on one master cylinder. This master cylinder will then activate different configurations of slave cylinder assemblies.

### 2.3.1 Wet Pipe Cylinder Systems

Actuation will be initiated by a frangible glass bulb. The pipework will be pressurised and connected to the cylinder valve on the master cylinder. The breaking of the glass bulb will cause activation and release of control pressure. This will open the pressure valve on the master cylinders and activate all slave cylinders.

### 2.3.2 Dry Pipe Cylinder Systems

The dry pipe system will be activated either by an external detection system or manually operated locally. Activation is triggered by an electric signal. The cylinder valve on the master cylinder will be a solenoid operated valve with manual override for safety reasons in case of electric failure. The master cylinder will then activate different configurations of slave cylinder assemblies.

### 2.3.3 Master Cylinder Assemblies

The master cylinder is the first nitrogen, and it is used to activate the entire system.

## 2.4 Pump Systems

Pump systems will operate between 120 bar and 160 bar with single pump flow rates ranging from 13.5L/Min to 140L/Min. Pump systems can utilise one or more pump units connected through a manifold to the water mist system to meet the system design requirements. The pump system can feed either automatic frangible glass bulb nozzles or open nozzles in both "wet" and "dry" applications.

When the system is activated, only one pump will be started. For systems incorporating more than one pump, the pumps will be started sequentially. Should the flow increase due to the opening of more nozzles (automatic wet systems only); the additional pump(s) will automatically start. Only as many pumps as are necessary to keep the flow and operating pressure constant with the system design will operate. The high pressure water mist system remains activated until qualified staff or the Fire Brigade manually shut off the system.

### 2.4.1 Wet Pipe Pump Systems

The discharge system pipework will be permanently filled with water, and a jockey pump will maintain a nominal pressure of 15 bar approx. This water pressure will be held by the piston valve in the nozzle. Minimal variations in pressure will be corrected by a jockey pump unit.

When one or more glass bulbs break as a result of fire, water discharges from the nozzle and the control pressure drops. When the control pressure falls and the flow is still present, the pump unit will activate to provide the system design operating pressure.

### 2.4.2 Dry Pipe (Open) Pump Systems

The dry pipe open system will be activated either by an external automatic detection system, or locally operated manually. Upon receipt of a signal from the detection system, the pump is started. The operating pressure and flow is constantly monitored by the control panel.

### 2.4.3 Pump Skid Units – General

The pump unit is a single combined skid mounted package made up of the following assemblies:

- tank
- tank inlet and filter
- return pipe
- tank overflow and level measurement
- suction line, including tank drain
- suction line manifold
- HP pump unit(s)
- electric motor (s)
- pressure manifold
- jockey pump (automatic wet systems only)
- control cabinet
- air compressor (pre-action systems only)

### 2.4.4 Water Storage Tank

The capacity of the water storage tank is determined by the system design for the individual projects. The tank serves as either a full capacity tank or a buffer storage tank. A full capacity tank is sized to accommodate the maximum system demand for the minimum discharge period; however, a buffer storage tank is not, so in this case the tank size will depend on the feeding capacity to the tank from an external water supply.

The external water will be supplied through a 75µ filter, via a solenoid valve into the storage tank. The water level in the tank is controlled by means of a water level control system mounted in the tank. The water inlet solenoid valve opens at low level and closes at high level, in the tank. The water supply to the tank should have a minimum pressure of 3 bar, with a maximum of 6 bar.

### 2.4.5 Tank Overflow

The tank overflow will be used to protect the tank against overfilling.

### 2.4.6 HP Pump Unit

The pump unit will consist of the following components:

- base frame
- electric motor
- coupling
- coupling protection
- pump
- safety valve

- strainer
- various connection elements, fittings, flexible hoses, etc.

### 2.4.7 Pressure Manifold

The pressure manifold will principally consist of the following components

- pressure manifold
- non-return valve per pump
- connecting hoses
- pressure sensors (2 pieces for systems with more than one pump)
- flow sensor (automatic systems only)
- pressure gauge
- test device
- system ball valve
- connecting hose (hose between pressure manifold and pipework)
- pressure relief valve - sets the pump pressure, and is dimensioned to be able to return the full pump capacity to the water storage tank, when the high pressure pump is started against a closed system.

### 2.4.8 Jockey Pump (automatic wet system only)

The jockey pump will consist of the following components:

- strainer
- rotary slide valve pump
- non-return valve
- pressure gauge
- safety valve

## 2.5 Nozzles

The nozzles in the high pressure water mist system will be modular. The nozzles will both be automatic or open, and consist of a socket and a nozzle body into which a number of micro nozzles are fitted. Automatic nozzles will use a frangible glass bulb with a piston valve as a built in detection/activation device.

## 2.6 High Pressure Wall Cabinets

High pressure wall cabinets with hose lengths up to 60 metres will be installed in the risk vicinity. Each wall cabinet is equipped with a Fog gun.

Individual wall cabinets are connected to a centralised pump unit via high pressure pipework. The pump unit is supplied with water from the water main or from an integrated tank. High pressure wall cabinets can be retrofitted to existing systems where a high pressure pump unit has already been installed.

## 2.7 Pump Control Panel

The control cabinet serves to control the electrical system and monitor all measurements of the pump unit. The operation of the unit is realised via the control cabinet (for automatic as well as for manual operation).

A 440v 3ph supply voltage is required to power the pump unit, this to be sized based upon the power (KW) rating of the unit. The power supplied will be transformed from 400v down to 230v for internal control equipment. All contactors of the main circuit will be supplied with this voltage. For controls such as PLC, relays and light signals, a voltage supply of 24v D.C. is formed. The 400v A.C. and 24v D.C. voltages are monitored with the respective relay.

Alarm indications are given for electric motor thermo failure, emergency stop activated, low and low water levels in the water storage tank. These alarms show as a common alarm in the control panel.

Alarm indications shall be available for remote monitoring via potential free contacts for the following:

Pump Running
Common Fault
Fire

Stop of high pressure pump(s) at low level in the water storage tank is also controlled, in order to secure that the pump is not operated without water.

## 2.8 AFFF Additives

In certain cases where hydrocarbon liquid fuel pool, spray, impregnated and/or wet surface fires are anticipated, other than in normal direct food applications, Aqueous Film Forming Foam (AFFF) shall be added to the water in the system, at 3%.

## 2.9 Detection Equipment

### 2.9.1 Fire Detection Control Panel (open dry systems only)

A) A 2 zone high pressure water mist fire control panel will be located adjacent to the main entrance/ exit to the protected space, as indicated on the tender drawings. The panel will be of rigid construction, and capable of being either surface mounted or semi-recessed as indicated.

B) The panel fascia will be equipped with light emitting diodes to indicate fire, fault and operational status, together with push action switches to control functions. The operation of the switches will be accessed via a key operated security key switch.

The following components will be provided on the control panel fascia.

a)Silence Alarm Switch
b) Test Evacuate Alarm Switch
c) Alarm Silenced Lamp
d) Isolate Remote Signal – Switch and Lamp
e) System General Fault – Lamp and Buzzer
f) Buzzer Silence
g) Power on Lamp
h) Lamp Test Switch
i) System Automatic Mode – Lamp
j) System Manual Mode – Lamp
k)Manual/Automatic Mode – Push Switch
l) Isolate Release Circuit – Switch and Lamp
m) Key Operated Security Switch
n) Manual Release Unit

A sealed lead acid battery will be provided within the control panel to provide 24 hours of panel operation, and a half hour under alarm condition

## 2.9.2 Smoke Detectors

Ionisation and optical type smoke detectors will be located as indicated on the tender drawings. Detectors will be connected together within each space to provide two zones of protection. Both zones will additionally connect to detectors in both ceiling and floor voids, where applicable.

## 2.9.3 Remote Status Indication Panels

A) Remote status indication panels will be located as detailed on the tender drawings.

B) Remote panels will display lamps indicating system manual, automatic or discharged conditions.

## 2.9.4 Manual Release Units

A) Manual release units will be located as indicated on the tender drawings.

B) Manual release unit casings will be coloured YELLOW, and inscribed with the lettering "HPWM MANUAL RELEASE POINT".

C) Mounting heights for manual release units will be agreed on site.

## 2.9.5 Sounders

A) Fire alarm sounders will be located as indicated on the tender drawings. First stage alarm bells will be coloured RED. Second stage alarm will be a combined electronic sounder and xenon beacon unit.

B) Mounting heights for the sounders will be agreed on site.

## 2.9.6 Remote Lamp Unit

Remote lamp units will be provided to give indication of an activated smoke detector within a ceiling or floor void.

## 2.9.7 Air Conditioning Shutdown Relay

An air conditioning shutdown relay will be provided to shutdown air conditioning on receipt of a first stage fire signal.

## 2.9.8 Power Distribution Unit Shutdown Relay

A PDU shutdown relay will be provided to shutdown the PDU on receipt of a second stage fire signal.

## 2.9.9 House Link Relay

A house link relay will be provided to interface the INERGEN system and the house fire alarm system.

## 2.9.10 Electrical Installation

All wiring associated with the system will be Calflam or Delta Firetoft. Cable or equivalent, sheath will be red. Cables will generally be either clipped to structural sofffit, slab, walls or timber ceiling rafters.

# 3.0 INSTALLATION

## 3.1 Pipework Specification

The surface of the tubing will be clean, smooth and free from scratches, die marks and other visible blemishes. To ensure compatibility between tube and fittings, all tubing supplied will conform to the tube manufacturer's recommendation for the following manufacturing variables (within the requirements of the previously mentioned codes and standards).

- Materials, method of manufacture
- Wall thickness and outside diameter
- Surface finish
- Hardness
- Concentricity
- Cavity

### 3.1.1 Tube - Stainless Steel

Welded or seamless stainless steel pipes in AISI 316, AISI 304L/304 or corresponding quality are required. The sizes of the pipes range from a diameter of 10.0 mm outer diameter x 1.0 mm wall thickness to a diameter of 60.3 x 3.91 mm.

## 3.2 Tube Fittings and Clamps

Pipe sizes from Ø 60.3 mm and down to Ø 30.0 mm are typically joined by press fittings or TIG welding, using butt welding fittings.

Pipe sizes below Ø 30.0 mm are joined by stainless steel (AISI 316) cutting ring fittings according DIN 2353.

Fittings will generally be manufactured from materials best suited to the service and process conditions. All fittings will have a minimum working pressure as specified for their respective service. Liquid thread sealants will be used rather than PTFE tape.

Pipe clamps shall be installed in accordance with the system design spacing's relevant to the tube sizes.

# 4.0 COMMISSIONING AND TESTING

## 4.1 Commissioning, Witnessing and Test Discharge

A) The Engineer will inspect all components on the high pressure water mist system whilst in operation. The fire suppression system specialists will advise the Engineer of the earliest possible date to witness the complete system.

B) A pressure test is to be carried out according to valid rules of the classification societies (1.5 times the design pressure). I. e. if the design pressure is calculated to 120 bars the test pressure is to be 120 x 1.5 = 180 bar. The engineer is to witness and approve the pressure tests.

C) The fire suppression system specialist will allow, within his works, for demonstration of the correct operation of all components of the system.

D) On completion of the commissioning, the fire suppression system specialist will issue a certificate starting that the system operated correctly, and will leave the system in a "*live*" condition.

## 4.2 Operating and Maintenance Instructions

Full operating and maintenance instructions will be provided by the fire suppression system specialist.