**COMPLETE SPRINKLER SPECIFICATION**

**DESIGNED UNDER BS EN 12845:2015**

**Responsibilities**, **and Considerations**

This sprinkler specification has been developed to specifically recognise and provide the highest level of fire protection engineering, monitoring, and endurance for project sustainability

Tenders will be strictly in accordance with the specification, drawings and requirements referred to in this specification document. The terms of this enquiry will apply to any contract resulting from this enquiry. Any tender submitted which includes deviations from this specification without prior written agreement will not be accepted.

Valued engineering benefits for the client’s long-term project carbon footprint will be given due consideration,

Inclusive of recycling, transportation, and limiting excessive water waste

**Forward**

This specification is for automatic fire sprinkler systems that fall under the current British and European Standard EN12845. This will include most insured risks as well as commercial, educational, entertainment and industrial premises. Where the sprinkler system is being installed for purposes of property protection the insurer will typically require the sprinkler system to be installed to the LPC rules (which is BS EN 12845 and the technical bulletins) which arepublished by the FPA (Fire Protection Association).

It is worth noting that the FPA state that the use or reliance on the LPC rules or any part of its content is in fact voluntary and make the statement that it is at the users own risk even though the Technical Bulletins actually take precedence where there is a conflict with the British Standard.

Automatic fire sprinkler systems that are installed in residential or domestic occupancies are usually covered under British Standard 9251 which is not covered by this specification.

Where a sprinkler system is installed for purposes of life safety, legislators, clients, consultants and fire sprinkler contractors should be aware that when there is a requirement for an automatic sprinkler system it is building control that has the specified works and the design shall comply with life safety which is stated in approved document B. The Technical Bulletins do make some enhancements regarding life safety which also extend to the “up keep” (by employing TB 203 as a replacement to clause 20) and therefore TBs are often specified for life safety sprinkler systems (even though once again they are optional).

It is important to remember that including all and every sprinkler standard (or code of practise) in a specification is not best practise and will often lead to confusion and an unsatisfactory end result. In most cases, a single sprinkler standard should be specified and conformed to. All proposed works should be approved by the end user and the AHJ before any works commence onsite.

**CONTENTS**

**1.0 PERFORMANCE OBJECTIVES**

**2.0 DESIGN PARAMETERS**

**3.0 SYSTEM WRITTEN CODE DESCRIPTION**

**4.0 CONTROL AND MONITORING REQUIREMENTS**

4.1 System Operation Alarm

4.2 Sprinkler Water Storage Tanks Alarms

4.3 Sprinkler Pump Set Alarms

4.4 Valve Status Alarms

4.5 Monitoring of additional equipment

**5.0 SCOPE OF WORKS**

5.1 Sprinkler Installer’s Responsibilities

5.2 Planned Shut Down

**6.0 INSTALLATION CONTROL VALVES**

6.1 General

6.2 Isolation Stop Valves

6.3 Drainage

6.4 Water Motor Alarm and Gong

6.5 Pressure Gauges

7.0 **SPRINKLER ZONING**

7.1 Introduction

7.2 Zonecheck Addressable

7.3 Zone valves

7.4 Water flow alarm switches

**8.0 ADDITIONAL EQUIPMENT**

8.1 Pipelines

8.1.1 General

8.1.2 Underground piping

8.1.3 Above ground pipng

8.1.4 Gradients

8.1.5 Pipe supports

8.1.6 Drainage

8.1.7 Flushing/test connections

8.2 System Ancillaries

8.2.1 General

8.2.2 Sprinkler heads

8.2.3 Flow measuring device

8.2.4 Water storage tank

8.2.5 Sprinkler pumps

8.2.6 Securing of valves

8.3 Fire and rescue service inlet

**9.0 FIXING TO BUILDING FABRIC**

**10.0 IDENTIFICATION OF MECHANICAL** **SERVICES**

10.1 General

10.2 Painting

10.3 Labelling and Signs

**11.0 TESTING AND COMMISSIONING**

11.1 General

11.2 Addressable Monitoring and Testing

11.3 Particular Requirements

11.3.1 General

11.3.2 Pipe pressure testing

11.3.3 Pump testing

11.3.4 Flow switch testing

11.4 Completion certificate

11.5 Training

**12.0 SCHEDULE OF INSTALLER’S SUBMISSIONS**

**13.0 SYSTEM MODIFICATIONS**

**Annexes**

A Sustainability

B.1 Planned Shut-downs

B.2 Un-Planned Shut-downs

**Referenced Texts**

**1.0 PERFORMANCE OBJECTIVES**

**2.0 DESIGN PARAMETERS**

The entire system installation shall comply fully with the current edition of the relevant codes of practice described in the tender documents.

Occupancy (description including building height)

Purpose of Sprinkler System Property Protection / Property Protection with Life Safety enhancements / "Special requirements for life safety" is now titled "Additional measures to improve system reliability and availability"

Authorities Having Jurisdiction

……………………………………………………………… ………………………………………………………………

……………………………………………………………… ………………………………………………………………

Hazard Classification ………………………………

Maximum Area of operation ….m2 or number of heads

Design discharge density ….mm/ min (or l/ s/ 100 m2)

Maximum area of coverage ….m2 per sprinkler head

Maximum distance between ….m

*(For High Hazard Storage Only)*

Stored Goods Category …….

Storage Configuration ……

Sprinkler heads

System type (or combination) Wet pipe

Wet pipe with tail end dry

Wet pipe with dry pendent heads

Wet pipe (other)

 Dry pipe

 Pre-Action (Type 1 or 2)

 Other (please specify)

Running pressure at control valve ….bar (or kN/ m2 ) minimum

Corresponding water flow ….. l/ s (or dm3/ minute) minimum

Water supply type

Water storage volume ….m3 minimum

Total number of installations ……………..

Total number of sprinklered zones ……………..

**3.0 SYSTEM WRITTEN CODE DESCRIPTION**

**4.0 CONTROL AND MONITORING REQUIREMENTS**

Generally to be in accordance with annex H & I of BS EN 12845.

4.1 System Operation Alarm

By means of a water pressure switch or flow switch, cause the fire alarm (and/or BMS systems) panel to operate when the sprinkler system automatic control valve opens.

4.2 Sprinkler Water Storage Tanks Alarms

Provide an alarm at the BMS of low water level and high water level independently for each water storage tank/ compartment. This alarm Shall be provided via the Zonecheck Addressable controller and loop to reduce additional systems and wiring.

4.3 Sprinkler Pump Sets Alarms

When more than one fire pump is present; ensure that the sprinkler pumps are configured as duty and back-up units with automatic changeover.

Provide pressure switches to control each pump operation suitable for adjustment to suit actual site conditions. Where both diesel and electric pumps are provided configure the installation to ensure that the electric pump is the duty unit under normal circumstances.

Provide automatic starting controls and manual stop to the pumps to LPC requirements. Provide at the sprinkler pump motor control panel, at the pump room monitoring panel the audible and visual warnings of the following conditions: -

~ Sprinkler Pump No.1 Electric/Diesel Driven

~ Pump on Demand

~ Pump Running

~ Supply Failure

~ Pump Trip

~ Sprinkler Pump No.2 Electric/Diesel Driven

~ Pump on Demand

~ Pump Running

~ Supply Failure

~ Pump Trip

A general “fault” signals from the pump house monitoring panel shall be linked back to the Zonecheck Addressable controller.

4.4 Valve Status

Provide electrical monitoring of the status of all Installation, Control, Stop and Alarm Gong valves. For life safety enhancement applications; monitored valves shall be wired into the local Zonecheck® Addressable IMM (installed and commissioned by certified partner). All other such valves shall be monitored via a micro switch to indicate whether open or shut.

4.5 Monitoring of Additional Equipment

Where additional equipment such as Gemini heads (see section 7.3.1), trace heating or other fire protection equipment is required, the signals shall be monitored using an IMM as part of the Zonecheck Addressable system.

**5.0 SCOPE OF WORKS**

5.1 Sprinkler Installer’s Responsibilities

Design, supply, install, set to work, test, commission, fully certify and handover a sprinkler system in accordance with the function and performance requirements and as stated in the Rules for Automatic Sprinkler Installations published by the Loss Prevention Council (LPC Rules) incorporating BS EN 12845.

Provide pressure and flow requirements at each and every design point and flushing/test connections on all the arrays that are required to meet the code requirements for the defined risk.

Confirm that the Installer’s name appears in the current “List of Approved Products and Services” published by the LPC and the current list of “LPCB Quality Assessed Companies to ISO 9001/ BS 5750-1” published by the Loss Prevention Certification Board (LPCB) and the contractor has the suitable level of competency to carry out, without supervision, the design and installation of the system(s) as specified herein.

Adopt the outline scheme design proposals indicated on the Tender drawings and specification, and develop them into a detailed design of the system in cooperation with the Design Team.

Prior to commencing the installation of the works, obtain the written approval of the AHJ(s).

Include within the design the following aspects: -

~ Sprinkler installation

~ Ensure that all components and equipment are of types approved by the LPC and entered on their current “List of Approved Products and Services”

~ Coordination of sprinkler positions with the Architect’s false ceiling design

~ Acoustic and vibration control measures

~ Piping supports, guides and anchors

~ Expansion/ contraction provision

~ Drawing production

~ Automatic controls and associated wiring for the sprinkler installation utilising the Zonecheck Addressable system for all remote testing.

~ Interfaces to the BMS and fire alarm systems (via the Zonecheck Addressable controller) ensuring correct communication protocol

Provide power and control wiring between the sprinkler pump motor control panel and any remote indicator panel. Provide power wiring to the sprinkler pump motor control panel from the distribution board in the plant room. Provide power and control wiring to the sprinkler pumps from the motor control panel. Comply with the requirements of BS 7671 for the electrical and control installations.

Ensure that the electrical and controls installation are made by an Electrical Contracting firm that is a member of the Electrical Contracting Association (ECA) and the National Inspection Council for Electrical Installation Contracting (NICEC). The Electrical Contracting firm must also be familiar with the Zonecheck Addressable system (training can be provide by Project Fire Products Limited).

5.2 Planned Shut Down

Any planned shutdown of existing sprinkler works, or sprinkler protection which has already been commissioned and is being relied upon for fire protection shall be avoided if possible either by using an alternative method or by using Livetap (any Livetap works to be carried out by an approved installer with current and active Livetap authorisation card). Before a planned shutdown can take place, RAMS documents with explanation of why Livetap is not suitable for the job and it must be agreed by all parties and approval must be sought from the AHJ(s).

In accordance with the project’s environmental policy, any water removed from the system must be taken off-site and disposed of in accordance with local water authority guidelines. In addition, any drain-downs of pipework must be re-filled with water via backfilling (rather than passing through installation control valve).

In addition, before a shutdown takes place the following shall be carried out:

 ~ Any central monitoring stations should be informed

~ Only one zone of a multi-zone installation shall be shut down at any one time and for the minimum amount of time possible

~ Any hot works in the area shall be subject to a permit system. Smoking and naked flames shall be prohibited in affected areas during the works.

~ Fire extinguishing appliances should be kept in readiness, with trained personnel available to handle them.

~ As much of the installation shall be retained in an operative state as possible by blanking off pipework feeding the part or parts where work is taking place.

~ The premises shall be checked to ensure that there is no indication of a fire shortly before work commences.

~ All occupiers that share sprinkler protection shall be informed of the works.

**6.0 INSTALLATION CONTROL VALVES**

6.1 General

Provide each sprinkler installation with a set of installation control valves. Provide for each installation control valve set all necessary water proving apparatus and alarm gong-testing facilities (included): -

~ If alarm valve is of a ‘wet’ type then each and every alarm valve shall incorporate. An LPCB approved strobe/sounder shall be installed instead of the water motor alarm gong where possible and permissible.

~ Gear Operated Butterfly Valve to BS 5155 or equal LPC approved valve with indicator to show when open and shut, electrical monitoring micro switch and padlock and strap

~ LPC Approved Alarm Valve, to suit type of system and pressure requirements having due regard for the code requirements with respect of type and bypass/duplicate requirements.

~ Where required, a Water Motor Alarm Gong (if fitted) for sounding an audible warning of system operation

~ Double pole pressure switch or flow switch for initiation of an electrical signal on system operation to both the Zonecheck Addressable system and main fire alarm/BMS system

~ Drain and Test Connections

~ Test Valve, Pipeline and fittings

~ All necessary small bore piping (galvanised), pressure gauges and valves in accordance with the requirement of the LPC Rules and Approvals

~ All piping, valves, straps, padlocks and identification labels as required by the LPC

6.2 Isolation Stop Valves

All sluice valves (if used) to comply with BS 5163. Ensure that all butterfly valves are gear operated and comply with BS 5155. Make all valves right handed. Clearly mark the controlling wheels of all stop valves showing in which direction the wheel is to be turned to close it; provide an indicator that shows whether the valve is open or shut. Isolation control valves shall be monitored via the Zonecheck Addressable system.

6.3 Drainage

Drainage facilities associated with alarm valves for draining the installation and testing of the alarm valve and water motor alarm gong (where fitted) shall be provided in accordance with the specified code standard.

6.4 Water Motor Alarm and Gong

Where possible and permissible, water motor alarm gongs shall be replaced by an LPCB strobe and sounder.

Where a water motor alarm gong is fitted, it shall be of the type approved and listed by the Loss Prevention Council.

Provide a 15mm test valve on the installation’s side of the alarm valve.

Arrange the piping to the Water Motor Alarm to drain through a fitting having an orifice not larger than 3mm diameter. Use a stainless steel or a suitable non-ferrous material for the orifice plate. Ensure the water alarm gong drainage piping is piped to discharge over a drain point.

6.5 Pressure Gauges

On all sprinkler installations, provide a pressure gauge (a) fitted immediately above the alarm valve and another gauge (b) immediately below the alarm and main stop valve.

Fit pressure gauges on main pump suction and delivery pipes and adjacent to each pump initiation pressure switch. Ensure all pressure gauges conform to BS 1780 with scales having divisions not exceeding 0.2 bar and of the glycerine filled type.

Provide means to enable each pressure gauge to be readily removed without interruption of installation water supplies.

**7.0 SPRINKLER ZONING**

7.1 Introduction

Where sprinkler system is for life safety, the building is to be zoned using Zonecheck Addressable available from Project Fire Products Ltd and shall be designed and built by Project Fire Products Ltd. Zonecheck Addressable is an approved system that allows for automated and centralised testing of all flow-switches in the building as well as providing centralised monitoring for sprinkler equipment.

All Zonechecks, whether supplied separately or as part of a Firepod must include a 10 year manufacturer’s warranty.

7.2 Zonecheck Addressable

Zoning must be designed in accordance with the specified code standards. Zoning design must also seek to minimise future disruption to both Landlord and Tennent by placing components in a readily accessible place and include sufficient quantity of zones so that sprinkler protection affected by a single zone drain down or alteration is minimised.

*For Shopping Centres, where a sprinkler system is reconfigured, or any ‘shop-fit’ is carried out, or a new tenant takes occupation then any work MUST include provision of a Zonecheck® (with IMM where Shopping Centre already has a Zonecheck Addressable system fitted) to enable routine testing of the flow-switch without the escape of water. The test point (where a non-addressable system is in place) should be a key-switch located in an easily accessible location, preferably adjacent to the fire panel or the electrical intake / distribution position and must be accessible without the use of tools or steps etc. Key-switches must not be located within the ceiling void.*

7.3 Zone valves

Zone valves are to be butterfly type, grooved and be LPCB approved. The zone valves shall be monitored via the Zonecheck Addressable system.

7.4 Water Flow Alarm Switches

Flow-switches shall be incorporated into the LPCB approved water flow detector tester Zonecheck® Addressable (Patent pending – No GB1606263.0.).

All water flow detector testers must comply with FM1043 Approval Standard for Water Flow Detector Testers and are installed in accordance with recommendations from Companion Guide to AS 1851 ‘Fire Protection Systems Testing – Water Conservation Handbook’.

Ensure all Water Flow Alarm Switches are of the type approved and listed by the LPC.

Incorporate an adjustable time delay relay (capable of operating between 0 and 45 seconds) in all Water Flow Alarm Switches.

**8.0 ADDITIONAL COMPONENTS/EQUIPMENT**

8.1 Pipelines

8.1.1 General

Ensure all piping is free from burrs, rust and scale and thoroughly cleaned prior to installation in accordance with QA procedures that shall be available to view on request. During installation of the Works, plug or cap all open ends with purpose-made iron or plastic closures to prevent ingress of dirt. On completion thoroughly flush each system out with clean water. Ensure that adequate drain points are provided for this purpose.

Ensure that where grooves are used, they are rolled and not cut.

Construct all metallic piping systems to provide electrical continuity throughout to comply with the requirements of BS 7671. Demonstrate Electrical continuity on each completed system. Where items including fittings, joints and components incorporated into the piping system break the electrical continuity, use bonding conductors to bridge the items.

Changes in pipe diameter shall be achieved via an eccentric socket (with flat side on bottom of pipe) where possible to aid effective flushing of pipework.

Branch pipes should be a minimum of 50mm diameter.

8.1.2 Underground piping:

Pipes shall be laid in accordance with the manufacture’s recommendations. Pipes and fittings shall comply with the requirements of the water suppliers code of practice together with the specifications identified in LPCB Technical Bulletin 227:2011:1, Table TB227. T1.

8.1.3 Above ground piping:

Pipes shall be a minimum of black medium weight black to BS EN 10255. Screwed fittings to be malleable iron to BS 143 (BS EN 2041). Welded fittings to be EN: 10253. All pipe work shall be coated with one coat of red‐oxide primer at works and touched up on site.

8.1.4 Gradients

Ensure gradients of piping are in accordance with the LPC rules. Prior to installation, agree with the Contract Administrator all minor adjustments of gradient required to suit site conditions or co-ordination with other services.

Install sprinkler piping so that the system can be thoroughly drained with the following minimum gradients: -

“Wet” Installation -2mm in 1m all pipes

“Dry” Installation -4mm in 1m for pipes sized 40mm NB or more

8.1.5 Pipe Supports

Comply as a minimum with Section 17.2 of the LPC Rules for the provision of pipe supports.

Where sprinkler heads are to be fitted in suspended ceilings, design the piping drops on a swivel arm basis to facilitate the location of the sprinkler head centrally in the ceiling tile or designated location. Provide additional fixings/ supports as necessary to prevent sagging or twisting of the final sprinkler position.

8.1.6 Drainage

Drainage connections shall be provided in accordance with the specified code standards. Where piping within the system will not drain back via the installation control valves, provide a drain valve at each lowest point that conforms to the following: -

Up to 50mm Ø piping 20mm Drain Valve (minimum)

65mm and 80mm Ø piping 32mm Drain Valve (minimum)

100mm and above Ø piping 50mm Drain Valve (minimum)

Adequate drainage within the pump house shall be provided in line recommendations from the pump manufacturer and tank manufacturer (if tank is internal to the building) and detailed in the tender package.

8.1.7 Flushing/Test Connections

Install flushing/test connections to the underside of pipe at the spur ends of the installation distribution pipe that conforms to the following.

Up to and including 40mm Ø piping Test/Flushing Connection shall be same as pipe diameter

50mm and above Ø piping 50mm Test/Flushing Connection (minimum)

8.2 Pipeline Ancillaries

8.2.1 General

Install all pipe ancillaries fully in accordance with BSEN 12845.

8.2.2 Sprinkler Heads

Verify the hazard classification, temperature rating and pattern of sprinkler heads required for each area within the premises. Locate sprinklers to provide coverage to conform to the hazard classification of each area.

A pre-action sprinkler head device, namely Gemini® (installed by approved installers) (available through Project Fire Products Ltd), shall be installed in accordance with the project specifications and drawings for areas where pre-action heads are required. Monitoring of Gemini heads shall be achieved via the Zonecheck Addressable system.

8.2.3 Flow Measuring Device

Provide a Flow Measuring Device in the Pump Room of the type approved by the LPC. Ensure that the Flow Measuring Device is complete with all necessary isolating valves. Fit a sluice valve upstream and a butterfly valve downstream of the device.

8.2.4 Water Storage Tank

Design and install suitable water storage tanks as required by and in compliance with the LPC rules. Provide information on quantity, type, material, size, construction and access for service/maintenance. Tanks installed shall have a minimum of a 10 year guarantee.

8.2.5 Sprinkler Pumps

Design and install pumps in accordance with the provisions of the LPC Rules and with due consideration for the site location and conditions.

Ensure the pumps are manufactured by a company which has been quality assessed by the Loss Prevention Certification Board to ISO 9000/ BS 5750 and appear in the current LPC list of approved products and services.

Wherever possible, pumps shall be installed under positive head conditions. Where suction lift if necessary, ensure the pumps are suitable to operate with suction lift conditions. Provide the pumps with water from twin suction pipes complete with vortex inhibitors as appropriate.

Ensure the duty of the main pumps meets the minimum pump characteristics set out in table 16 of BS EN 12845.

Fuses, electrical switch gear and trip functions associated with fire pumps must be sized in accordance with approved fire pump manufacturer guidelines and not sized to protect the equipment.

Arrange the pumps as a pair with one pump considered as duty and the second pump as stand by. Ensure the two pumps deliver, via non-return and stop valves, to a trunk main which feeds to the Sprinkler Control Valves.

Fit appropriately sized test connections (complete with 2 No stop valves and approved direct reading flow meters) between the sprinkler pump delivery trunk main and town main connection, ensure these discharge back into the suction tanks. Arrange the return connection so that entrainment of air into pump suction does not occur during testing.

Control the operation of the pumps by pressure switches, connected individually to the appropriate trunk mains and complete with pressure gauges, stop valves and bypass with check valve as called for in the LPC Rules.

Individually support Pump Delivery and Suction piping to ensure that no load is imposed on the pump sets.

Install and commission the pump sets fully in accordance with the manufacturer’s recommendations and in conjunction with the manufacturer’s Commissioning Engineer. Particular attention should be given to including a suitable plinth (of correct material, thickness, size, level and smoothness) for mounting the fire pump securely using chemfix bolts or similar method in line with pump manufacturer’s recommendations.

Use pump sets that are centrifugal single stage type direct coupled to an electric motor suitable for the local electricity supply and mounted on a common base plate. Ensure each pump set is fed from a Star Delta Starter panel which incorporates all of the requirements of BS EN 12845.

Provide a Jockey Pump set to make up small losses in the trunk mains without bringing into operation the main fire pumps. Use a vertical multistage pump, directly coupled to suitably rated electric motors, drawing water from the common suction pipe. Ensure the Jockey Pump is complete with direct on line starter.

Provide a common remote alarm panel, wired into a position in the Fire Control Centre at Ground Floor, to give audible and visual warning of the conditions set out in BS EN 12845. Ensure that the panel is mains operated (with full battery backup in the event of mains failure) and complies with the requirements of BS EN12845.

8.2.6 Securing of Valves

Secure all stop valves (which are not electrically monitored) on the water supply mains with strap and padlock. Secure the main stop valves and the installation control valves with leather straps and padlocks. Secure all other valves with leather straps.

8.3 Fire and rescue service inlets

Unless stated elsewhere or with written agreement a fire and rescue service inlet shall be provided in accordance with TB232.3.5.

**9.0 FIXING TO BUILDING FABRIC**

In accordance with BS EN 12845.

**10.0 IDENTIFICATION OF MECHANICAL SERVICES**

10.1 General

In accordance with BS EN 12845.

10.2 Painting

Apply one coat of primer paint, one coat undercoat and two coats red gloss to all exposed piping and, upon completion, touch-up to repair any damage caused to the finish by the installation work. Apply ID banding to all piping in accordance with BS 1710.

10.3 Labelling and Signs

Supply and fit a ‘location plate’ on the valve access route in a position to be agreed with the Architect, bearing the following words: -

 SPRINKLER STOP VALVE

 INSIDE

Arrange its letters to be at least 35mm in height and the word 'INSIDE' to be in letters of at least 25mm in height.

Fit all valves with engraved aluminium labels stating their number and purpose.

Individually identify all valves on a schedule (produced in resilient material) wall mounted in the Fire Pump Room. Include a copy of this schedule with the Operating and Maintenance Instruction Manual.

**11.0 TESTING AND COMMISSIONING**

11.1 General

Comply with the relevant clauses of BS EN 12845.

11.2 Addressable Sprinkler Monitoring & Testing

The activation of the sprinkler system (via signals from flow switches) shall be detected via the Zonecheck Addressable Controller and shall be integrated into fire strategy for the building. All monitored zone valves and flow-switches (including flow switches on alarm valve) shall be connected via the IMMs back to the Zonecheck Addressable Control Unit. This unit shall be UL approved and installed & commissioned via a suitably trained, competent approved and installers. This system gives the ability to test, record and monitor all key fire and fault signals and test flow switches and wet alarm valves. A Zonecheck Addressable printer must be included as part of the system to enable the printed evidence of testing.

11.3 Particular Requirements

11.3.1 General

Carry out all tests and inspections to prove that the installation meets with the requirements of BS EN 12845. Carry out all tests required by the District Surveyor or/ Building Control Officer giving adequate notice with regard to timing of tests, etc.

Inspect and test the installation at agreed stages to ensure that the piping is properly secured and clear of obstructing debris and superfluous matter and that all work which is to be concealed is free from defects before it is finally enclosed.

11.3.2 Pipe pressure testing

Carry out a low-pressure air test, to establish whether open ends are present, prior to carrying out a hydraulic test on completion of the installation, or sections thereof.

All installation pipework shall be hydrostatically tested for no less than 2 hours, to a pressure of no less than 15 bar, or 1.5 times the maximum pressure to which the system shall be subjected, (both measured at the installation control valves), whichever is the greater.

Dry pipe work shall be tested pneumatically to a pressure of no less than 2.5bar for no less than 24 hours. Any leakage that results in a loss of pressure greater than 0.15 bar for the 24 hour period shall be corrected.

11.3.3 Pump testing

Fully test all pumps through their full range of capabilities up to and including nominal ratings. Ensure that the duties are within the tolerances specified in LPC Rules.

11.3.4 Flow switch testing

All flow-switch testing shall be completed using a water flow detector tester in accordance with FM1043. Flow switches should be first tested manually by draining water and then by Zonecheck Addressable system. Test all alarms and alarm connections associated with the sprinkler installation and prove all interlocks and links to other systems and remote locations.

Upon completion of the installation of the system carry out functional tests in the presence of all interested parties to demonstrate to the satisfaction of all present that the installation conforms to the required standards.

11.4 Completion Certificate

When these tests have been accepted by all parties as being satisfactory, issue a completion certificate (as defined in Section 10 of the LPC Rules), issue an LPCB Certificate of Conformity (as required in LPS 1048) and register the installation as a Certified Sprinkler System.

Keep a record of all pressure tests carried out to include the following: -

~ Date of test:

~ Location and identification of pipeline:

~ Drawing Reference:

~ Method of Test:

~ Test Pressure:

~ Result of Test:

~ Signature of operative carrying out test and Company:

~ Signature of Witnessing Supervising Officer or his approved Representative:

Carry out two inspections, the first 6 months and the second 12 months after completion of the installation. Include the following tasks in the inspection: -

Water Supplies

~ Carry out running and proving tests on both pump sets.

~ Check correct operation of float valves on water storage tanks.

~ Check rate of infill to water storage tanks.

~ Exercise and grease stop valves on incoming Mains Supply, pump suction and delivery piping and ensure that they open and shut freely.

~ Check operation and seating of non-return valves/ alarm valves.

~ Check valve glands for leakage.

~ Check pump glands for leakage.

~ Check operating pressures on pressure switches.

~ Check operation of Jockey Pump.

~ Check operation of pressure relief valves on pumps.

~ Check operation of remote alarm functions.

Installation Control Valves

~ Carry out flow and pressure tests.

~ Check satisfactory operation on Turbine Alarm Gong.

~ All alarm-valve testing shall be in accordance with BS 12845 using guidance from HB 223 (2008): Fire Protection System Testing – Water Conservation Handbook.

General

~ Exercise and grease all stop valves and ensure they open and shut easily.

~ Check valve glands for leakage.

~ Check seating of alarm valves.

~ Check all pressure gauges are registering correctly.

~ Check satisfactory operation of all flow switches and monitored stop valves.

~ Check all small bore piping, valves and ancillaries for satisfactory operation.

~ Check spacing and location of sprinklers in relation to any new walls or partitions erected since completion of systems.

~ Ensure all valves are suitably secured and labelled.

~ Systems to be left in fully operational condition.

11.5 Training

Training on how to conduct regular testing regime and location and operation of all key components shall be offered to client/building owner.

**12.0 SCHEDULE OF INSTALLER’S SUBMISSIONS**

Submit the following for comment by the Engineer: -

 ~ Record of all test data (including method statements)

 ~ As fitted drawings

 ~ Detailed O&M manual with all components listed

~ Detailed schedule of recommended testing, servicing and maintenance of all relevant components over next 10 years

**13.0 SYSTEM MODIFICATIONS & ALTERATIONS**

All system modifications shall be completed with no drain down and no disruption to normal business by using the Livetap under pressure drilling system (any Livetap works to be carried out by an approved installer with current and active Livetap authorisation card).

Where works cannot be completed using Livetap:

* Written consent shall be sought from both the end user and the AHJ using the guidance in place for a planned shutdown.
* A Livetap quick drain will be used to establish that the correct installation/zone has been drained down in preparation of the works.
* Due regard for health and safety of other building users must be made a priority including ensuring that any hoses are run in the safest manner (against walls and not obstructing corridors etc.). Additional drainage connections using Livetap Kwik Drain shall be added if this will enable safer routing of hoses.
* Pipes shall be re-charged with water via back-filling and not by employing fire or jockey pumps.

Any new drain-valve shall be installed using Kwik-Drain. Where it is found that the existing installation does not comply with drainage requirements under current code standards, additional drainage connections shall be added as a matter of urgency.

Any new/extra heads shall be installed using No-Drain-T, even in situations where a drain-down is applied. A Zonecheck Live or Zonecheck Live SA shall be employed where an existing flow-switch is present. Any new vent shall be Kwik-Vent or automatic air vent which are available from Project Fire Products LTD. Existing sprinkler protection must be maintained at all times – there must be no loss of protection at any stage. Where sufficient clearance is available from the underside of the fire main feeding the proposed fire sprinkler modifications then the preferred orientation for all No-Drain-T applications is affixed to the underside of the sprinkler main. This provides the most favourable clearance in the vertical orientation for the Livetap drill.

Any water removed from remote points on the sprinkler pipework (i.e. any point from the alarm valve onwards) must not be disposed of down standard drains and must be removed from site. Evidence of the water being correctly and appropriately disposed of shall be provided.

END

**Annex A – SUSTAINABILITY**

Automatic fire sprinklers form an important part of a building’s strategy for fire protection but also for sustainability. Sustainability is often thought of as only to do with saving materials during construction and saving energy over the building’s life-cycle. There is a significant environmental and financial cost to repair or rebuild after a serious fire; therefore installing a sprinkler system which can tackle a fire before it takes hold is a sustainable tool as well as reducing damage, injuries and deaths.

In order for a sprinkler system to provide all of the benefits of property protection and life safety then the sprinkler system must be maintained and be ‘fit for purpose’. Maintenance, testing and servicing requirements are laid out in Section 20 of BS EN 12845 and Technical Bulletin 203. I would highly recommend that at hand over that all documents necessary (including an as-fixed drawing with details of all components installed along with a time plan of testing and servicing requirements) to fully understand the servicing and maintenance requirements be passed to the property owner. In this way, the property owner cannot say, in the future, that they did not know a particular component required regular testing, servicing and/or maintenance.

That being said, the British Standard and the Technical Bulletins do not cover many sustainable and best practice methods of carrying out these tests.

**Sustainable Products**

Zonecheck, carries out a fully code compliant test (traditional tests would not comply with FM1043) whilst removing no water from the sprinkler system. In a building with 100 flow-switches, traditional testing (at quarterly intervals as required by BS EN 12845) would result in around 128,000 litres of water being discharged over the course of the year. Testing with Zonecheck would result in 0 litres.

Zonecheck is not only sustainable by saving water though; since Zonecheck works by circulating water rather than discharging it, pipe work corrosion is reduced and therefore the pipes will last longer before they need replacing. This is because corrosion takes place between the dissolved oxygen (and other trace amounts of chemicals) within the water and the iron in the steel pipes. Once this dissolved oxygen (and other trace amounts of chemicals) are used up, the rate of corrosion will drop to negligible levels. In addition, testing with Zonecheck does not activate the fire pump(s) (if present) which saves on unnecessary wear and tear which means that the fire pump(s) will last longer. For a building with 100 flow switches, traditional testing would activate the fire pump 400 times per year when it only needs to be tested once a week.

The water saving claims made by Project Fire regarding their Zonecheck technology has been carefully scrutinised by UL was granted Environmental Claims Validation status in 2014.

**Sustainable Methods**

Once a sprinkler system has been installed there are various sustainable methods that can be utilized to help with system modifications, carrying out the more irregular testing and servicing requirements, increase system life and verify that the system remains fit-for-purpose. Examples of these methods are described below:

**Livetap**

Livetap is an LPCB, FM and VdS approved system for carrying out sprinkler modifications, alterations and investigations without draining down. Livetap allows sprinkler pipework to be drilled whilst the pressurised water remains inside. This is inherently a sustainable method as the water which is drained out for traditional modifications is saved. The amount of water within the pipework varies from greatly from building to building and will also depend on whether the building is zoned, which would allow for a single zone to be drained. This draining and re-filling process takes time which is chargeable by the contractor responsible for carrying out the works. Livetap also helps to reduce corrosion levels in the pipework as draining and re-filling with fresh water provides oxygenated water to re-start the corrosion process.

Fire pumps are normally engaged to re-fill the sprinkler pipework and this causes unnecessary wear and tear and the pumps which will then have to be replaced sooner.

Where new pipework is added, BS EN 12845 (19.1.1.2) requires that all new pipework be pressure tested to 15 bar. Where pipework has been added via a drain down, all existing pipework (or all pipework in the zone) would have to be pressure tested to 15 bar. This process can cause leaks to appear in the older pipework which would then need to be repaired at extra cost and time. With Livetap, only the new pipework would be pressure tested before joining onto the existing pipe.

The major advantage for Livetap is that sprinkler protection is maintained at all times. For a life safety sprinkler system this is of paramount importance, particularly for buildings like airports, shopping centres and hospitals which have very limited periods where a shutdown could take place.

Livetap can be used for a variety of applications such as

* Adding pipework
* Adjusting sprinkler head positioning
* Adding drain/flushing connections
* Adding venting connections
* Fitting Zonecheck around an existing flow-switch
* Taking samples of pipework for corrosion/condition analysis

Using Livetap has many other advantages which are listed below:

* Works can be completed in normal working hours
* There is no dirty sprinkler water to dispose of
* No problems in accessing drain valves
* No drain down arrangements to make
* No drain down fees
* No alarms to be isolated

**Circulating cooling line for Diesel Pump Testing**

When testing or running a diesel sprinkler pump it is common practice (and a sustainable solution) to circulate the cooling line water back into the main sprinkler tank.

**Annex B.1 Planned Shut-downs**

Agreement for a planned shutdown must be obtained from all the interested parties. And in particular approval from the Authority Having Jurisdiction. To obtain their approval it is essential that the AHJ is provided with an explanation which at least includes the following:

1. ***Why*** the installation or part thereof is to be drained. A drawing should be provided showing full details of the proposed works, and confirmation that the works shall comply with the relevant Code Standards should be also stated.
2. ***What***part if any of the installation will be taken offline together with the full details of the scope including what will be added or modified. The works should be executed by a competent specialist contractor who can verify their competence.
3. ***Who*** will actually execute the works and written confirmation with the verification of their competency. Who will be the onsite person responsible to supervise that the proposed works shall be in accordance with the construction drawing and the written code standard.
4. ***How*** will the works be executed, this must be provided by way of a written method statement, giving full details of the sequence for the planned works, and over what period of time. Also provide full details of areas that will be **without protection** should be clearly defined and the approximate time that each area will be unprotected should be provided.

**Note:** It is vital that the works should not commence until the specialist has written consent from AHJ.

The provision of this information is essential to enable the AHJ to give their approval. The AHJ or some other responsible authority may also instruct that additional vigilance be put in place, such decisions would be dependent upon the information provided and if the premises in part or in whole is without the required fire protection for what he considers to be an unreasonable amount of time, “patrols may be required” / or training maybe a requirement in respect of other firefighting equipment which may be required to meet the additional vigilance that is demanded.

Written codes for automatic sprinkler systems spell out the requirements when any part of a fire sprinkler system is not fully operational, and for **life safety** they are more stringent. The AHJ is the local fire prevention officer (civil defence) and their requirements are to be followed.

* The authorities and any central monitoring station should be informed;
* Only one Zone of a multi-zone installation shall be shut down at a time. An installation or zone shall be shut down for the minimum time necessary for maintenance (for life safety, a maximum of 4 hours).
* The partial or complete shutdown of a life safety sprinkler installation shall be avoided wherever possible. Only the smallest part of the installation necessary shall be isolated.
* Any hot work should be subject to a permit system. Smoking and naked lights should be prohibited in affected areas during the progress of the work.
* Fire extinguishing appliances should be kept in readiness, with trained personnel available to handle them.
* As much as possible of the installation should be retained in an operative condition by blanking off pipework feeding the part or parts where work is taking place.
* Before a system is wholly or partly shut down every part of the premises should be checked to ensure that there is no indication of fire.
* Where premises are subdivided into separate occupancies with buildings in communication or at risk, yet protected by a common sprinkler system or installations, all occupiers should also be advised that the water is to be turned off.
* When a zone (or zones) is charged or recharged with water after draining, the flushing valve(s) shall be used to check that water is available in the zone (or zones).

**Annex B.2 Un-Planned Shut-Downs**

When an installation is rendered inoperative as a matter of urgency or by accident, the precautions should be observed as far as they are applicable with the least possible delay. The authorities concerned should also be notified as soon as is possible.

**When the alarm sounds (from a flow in the water suppression system)**

(a) The fire and rescue service should be called, even if there is an automatic fire and rescue service connection, in order to confirm that a call has been received.

(b) Only after carrying out (a) should the cause of the alarm be investigated if it appears safe to do so.

(c) On no account (other than the express command of the fire and rescue service) should the main sprinkler stop valve be closed unless it is certain that there is no fire or that it is out. Even if an extinguished fire is found in one area the whole building should be searched before the valve is turned off - there may be more than one seat of fire; and

(d) The decision to shut down an installation or zone which has operated **because of a fire** should be taken only by the fire and rescue service.

**Reinstatement**

Following a shutdown, the operated sprinkler heads shall be replaced by heads of the correct type and temperature rating, and the water supply restored. Unopened sprinklers around the area in which operation took place shall be checked for damage by heat or other cause and replaced as necessary. Components removed from the system should be retained by the user for possible examination by an authority.

**Incident report**

The fire insurer should be informed of any incident whether or not an insurance claim is made.

**Minimizing the Effects**

Maintenance, alterations and repair of systems which are not fully operational should be carried out such as to minimize the time and extent of non-operation.

When an installation is rendered inoperative the user should implement the following measures:

1. The authorities and any central monitoring station should be informed;
2. Supervisory staff in the areas affected should be notified and the area should be patrolled continuously;
3. Fire extinguishing appliances should be kept in readiness, with trained personnel available to handle them;
4. Implement with urgency; As much as possible of the installation to be retained in an operative condition by blanking off pipework feeding the part or parts where work is taking place; Where possible parts of installations should be reinstated to provide some protection by using blinders and blanks within the pipework; the blinders and blanks should be fitted with visible indicator tags numbered and logged to aid timely removal.
5. Alterations and repairs to an installation or its water supply should be carried out and implemented immediately.
6. Hot works; Smoking and naked lights should be prohibited in affected areas during the progress of the work;
7. Where an installation remains inoperative all fire doors and fire shutters should remain closed and the whole area should be permanently patrolled until the protection is brought back to ‘normal’.

**Reference Texts**

BS EN 12845 (2015): Fixed firefighting systems. Automatic sprinkler systems. Design, installation and maintenance

LPC rules for Automatic Sprinkler Installations (updates up to and including December 2015)

BS 9251 (2014): Fire sprinkler systems for domestic and residential occupancies. Code of practice

AS 1851 (2005): Maintenance of Fire Protection Systems and Equipment

HB 223 (2008): Fire Protection System Testing – Water Conservation Handbook

BS EN 12259: Components for sprinkler and water spray systems.