

Guidance on Maintenance of Smoke Control Equipment





FOREWORD

This **Smoke Control Association (SCA)** guidance aims to help Building Representatives

- Identify smoke control system assets (including images of examples)
- Offers pointers on the information that should be recorded
- Provide advice about regular testing, maintenance and record-keeping aligned to current regulations and legislation.

The **Regulatory Reform (Fire Safety) Order 2005** requires that the Building Representative

'must ensure that the premises and any facilities, equipment and devices... are subject to a suitable system of maintenance and are maintained in an efficient state, in efficient working order and in good repair.'

The Building Safety Act 2022 introduced new roles and legal duties for people and organisations who are responsible for managing building safety risks in High Risk Building as defined by the Building Safety Act 2022 and the Higher-Risk Buildings (Descriptions and Supplementary Provisions) Regulations 2023 in England.

Each HRB in England must have one clearly identifiable accountable person, known as the Principal Accountable Person (PAP). The role of the PAP is significant and necessary to ensure the safety of people living in HRBs.

Building owners must ensure maintenance complies with UK safety regulations, provide risk assessments, and maintain safe access to work areas. They should keep detailed maintenance records, use qualified contractors, and mitigate risks from systems being offline during testing by implementing temporary safety measures. Emergency preparedness and adherence to safety standards are essential to minimize overall risks.

Furthermore, since January 2023, the **Fire Safety (England) Regulations 2022 (the Regulations)** has made it a requirement for Building Representatives of **high-rise residential buildings to provide fire and rescue services with electronic and paper versions of building plans and key fire safety information**. Outside of England, other legislation may apply.

This statutory requirement presents significant challenges to Building Representatives as the current level of fire safety asset information installed in many buildings is poor. Building Representatives must assemble information that will enable them to understand how their buildings have been designed to perform in a fire situation. This means identifying and understanding the fire safety equipment installed and how this equipment is meant to function as part of a wider system of protection. **Fire Safety (England) Regulations 2022 (Regulation 7)** also **requires any faults identified with equipment that cannot be rectified within 24 hours to be reported to the local fire and rescue service via electronic means**. This is challenging when even a basic list of fire safety assets doesn't exist.

**THIS GUIDANCE IS AIMED AT ASSISTING BUILDING OWNERS / MANAGERS
IN MEETING THEIR STATUTORY REQUIREMENTS**

KEY:

Block Text – Quotation from referenced document

Blue – Emphasis – SCA Advice and Best Practice

Red – Statutory Compliance Requirements



TABLE OF CONTENTS

SCA WORKING GROUP	4
GLOSSARY	5
INTRODUCTION TO SMOKE CONTROL	7
IDENTIFICATION OF SMOKE CONTROL ASSETS	8
Type 1: A new installation, recently completed	8
Type 2: An existing installation	8
SMOKE CONTROL ASSETS AND SYSTEMS	9
Components / Assets	9
Systems	9
MAINTENANCE RECOMMENDATIONS	10
SMOKE CONTROL SYSTEM INSPECTION SCHEDULES	11
APPENDIX A FAILURE FLOWCHART	29
APPENDIX B MAINTENANCE CERTIFICATE	30
APPENDIX C – EXAMPLE LOGBOOK	31
APPENDIX D	33
EXAMPLE OF MECHANICAL SYSTEM AND POTENTIAL ASSETS	33
EXAMPLE OF NATURAL SYSTEM AND POTENTIAL ASSETS	34
EXAMPLE OF CAR PARK SYSTEM AND POTENTIAL ASSETS	35
APPENDIX E – EXAMPLES OF SUBSTANDARD PRACTICE	36
DISCLAIMER	40
BIBLIOGRAPHY	41



SCA Working Group

LIST OF PARTICIPANTS:

Conor Logan	Colt International
Simon Sheldon	FDS Contracting
Paul Goldsmith	FTG Ltd
Ricky Cook	JLA
Christina Kebbell	LINK Smoke Control
Jacquie Williams	SCS Aftercare
Will Perkins	SE Controls
Anthony Munn	Vent Engineering
Lorenzo Jones	Vent Engineering

RELEVANT PREMISES

- **Article 6 of the Regulatory Reform (Fire Safety) Order 2005** confirms that the **order applies to all premises including workplaces, commercial buildings, and non-domestic parts of multi-occupied residential building premises in England & Wales**. Specific premises outlined in Article 6 (1)(a)-(g) are excluded (including offshore installations, ships, fields, woods, agricultural land, aircraft, locomotives, or rolling stock, mines or borehole sites).
- The **Fire Safety Act 2021** has amended the original description to include **the building's structure, external walls and all doors between the domestic premises and common parts (including flat front doors)**. The reference to external walls now includes windows in those walls and anything attached to the exterior of those walls, including balconies.

ROLES

- **Building Representative** – This guide refers to a Building Representative, which is deemed to refer to a person or position that holds or combines one or more of the roles below:
 - **Principal Accountable Person and Accountable Person** – as defined in the **Building Safety Act 2022** which can be found at <https://www.hse.gov.uk/building-safety/roles.htm>
 - **Building Representative** – Under **Article 3 of The Regulatory Reform (Fire Safety) Order 2005**, the Building Representative is defined as (a) an employer (in relation to a workplace), or (b) the person who has control of the premises (as occupier or otherwise) in connection with the carrying on of a trade, business or other undertaking or (c) the building owner, where the person in control of the premises does not have control of the building.
 - **Duty Holders – Article 5 of The Regulatory Reform (Fire Safety) Order 2005** specifies that anyone who has obligations relating to the maintenance, repair or safety of any premises is a Duty Holder. A Duty Holder is considered to have control of a premises if they have a contract or a tenancy agreement that makes them responsible for the maintenance or repair of the premises. Examples of Duty Holders may include (but are not limited to) a managing agent or a shift / duty manager, Fire Risk Assessor, a fire alarm engineer or other similar role.
- **Nominated Person**
 - *is nominated by the Building Representative Person and responsible for visually inspecting, listening to, and operating the system regularly to ensure it functions as intended. They report any faults, maintain basic records, and ensure the system remains in compliance with fire safety requirements.*
- **MMO**
 - Maintenance Management Organisation.
- **Competent Person**
 - Is defined by the **Regulatory Reform (Fire Safety) Order 2005** as an individual who has sufficient training and experience or knowledge and other qualities to enable properly to assist in undertaking the preventative and protective measures.
 - Must have sufficient training on the layout of the system installed in the building they are inspecting to adequately undertake the daily, weekly, monthly and quarterly inspections.
- **Competent Maintainer**
 - Maintenance organisation having appropriate training, skills, knowledge, experience and behaviours suitable for undertaking maintenance of smoke control systems. *The SCA recommends that the organisation is certified under the IFCC SDI 19 scheme for maintenance activities.*
- **SMOKE CONTROL SYSTEM**
 - Can refer to natural ventilation, extraction, pressurisation systems. Any system with the express purpose of clearing smoke.
- **ATS (Automatic Transfer Switch)**
 - An Automatic Transfer Switch (also known as an automatic changeover device) for a smoke system refers to a device that automatically switches the source of electrical power for the smoke system from primary to secondary power in the event of a power failure.
 - The ATS is designed to ensure that the smoke system continues to function properly even when the main electrical power supply is lost. This ensures that the smoke system remains operational and can effectively detect and control smoke in the event of a fire, providing the necessary protection to occupants and property.



- **UPS (Uninterruptible Power Supply)**

- This refers to a secondary power supply designed to ensure continuous operation of the smoke control system in the event of primary power failure.

- **PANEL**

- Also known as a controller, status panel, control panel.

- **FIRE DETECTION METHOD**

- Fire Detection Method refers to the various methods and devices used to detect smoke and initiate an automatic smoke control system, primarily via smoke detectors but can also include heat detectors, beam detectors, video monitoring, sprinkler flow switches or other approved methods.

- **FIREFIGHTER SWITCHES**

- A manually operated device allowing various levels of control of the smoke control system. Typically located in an accessible location and designed for ease of use by firefighters.
- Also known as firefighter override switch (FOS), manual control points, smoke vent switch.

- **SDI 19**

- A Certification Scheme for smoke control installation and maintenance managed by IFC Certification Limited (IFCC).



INTRODUCTION TO SMOKE CONTROL

A well-designed, properly installed, commissioned, and maintained smoke control system can be life-saving and help safeguard property. These systems are crucial in managing fire safety by either:

- Creating and maintaining a smoke-free layer above the floor to aid in safe evacuation.
- Reducing the accumulation of smoke and heat by extracting smoke and hot gases during the early stages of a fire.

By efficiently managing smoke, these systems play a vital role in enhancing building safety and minimising damage.

Key benefits of smoke control systems include:

- Keeping escape and access routes free from smoke to ensure safe evacuation and access for firefighters.
- Facilitating firefighting operations by improving visibility and reducing heat.
- Delaying or preventing flashover, thereby lowering the risk of fire escalation.
- Minimising damage to the building by slowing the lateral spread of fire and preventing smoke logging.
- Reducing financial losses associated with fire damage and downtime.

The effectiveness of smoke control systems in evacuation, fire damage mitigation, and firefighting is widely recognised. However, their performance relies on regular testing and maintenance by trained and competent personnel, ensuring they function as intended when needed most.

It is important that tasks which require specialist knowledge are only undertaken by competent personnel.

BS 7346 Components for Smoke Control Systems Part 8: Code of Practice for planning, design, installation, commissioning, and maintenance (2013) recommends that

"smoke control equipment should only be maintained by a competent person with specialist knowledge of smoke control systems, adequate access to spares and sufficient information regarding the system".

In light of **Dame Judith Hackitt's** call to industry to improve competence (see Glossary), the SCA introduced the SDI 19 Certified installer scheme. SDI 19 is independent, accredited by **UKAS** and managed by **KIWA** (previously known as IFCC). SDI 19 certification is a requirement for membership of the Smoke Control Association. A Service and Maintenance certification scheme is currently being developed.

The scheme reviews and assesses the knowledge, competence, and ongoing quality levels for installers of smoke control systems and the SCA strongly recommends only SCA and SDI19 certified organisations are employed for the maintenance of smoke control systems. A list of SDI19 certified smoke control organisations is available from the SCA website – [Smoke Control Association](#).

HAVING SUITABLY TRAINED AND EXPERIENCED PERSONNEL
IS A KEY FACTOR IN ENSURING COMPETENCE



IDENTIFICATION OF SMOKE CONTROL ASSETS

The information gathering process can be divided into two categories:

TYPE 1: A NEW INSTALLATION, RECENTLY COMPLETED

In this instance the information described above must be provided to the Building Representative under the **Building Safety Act 2022** as part of the digital Golden Thread.

TYPE 2: AN EXISTING INSTALLATION

For existing buildings, if no original design / performance criteria is available, the Building Representative should quickly begin the process of building an asset register through physical inspection of the building, identifying smoke control system components. SCA members may be able to assist with building the asset register.

This process will involve identification and inspection of existing assets. For example roof lights at the top of a staircase are often installed as smoke vents. The Building Representative needs to establish the exact function of the rooflight and then also find out enough information to make sure it can be incorporated into an ongoing inspection regime along with a method of recording any operational issues for the ongoing safety case.

It is helpful to identify manufacturers of the smoke control system components, typically through any markings and labels on the products. The SCA membership website contains a list of manufacturers as well as installers and the members should be able to assist in providing information which can enable the Building Representative to meet their obligations.

Example images of what to look for are listed at Appendix D

TYPES OF SMOKE AND HEAT SYSTEM	DESCRIPTION
NATURAL Natural Smoke Control Systems NSHEV(s)	Uses natural forces of thermal buoyancy to drive flow through the ventilator in specified areas, (e.g. Staircases, protected corridors)
PRESSURISATION Pressure Differential System (PDS)	Uses mechanically created positive pressure differentials to keep specified areas clear of smoke
MECHANICAL EXTRACT Mechanical Smoke Ventilation Systems (MSVS)	Uses mechanical extraction to remove smoke from specified areas and introduce clean air typically from the head of stair.
CAR PARK	Generally uses Mechanical fans to limit concentrations of carbon monoxide (CO) and other vehicle emissions in the day-to-day use and to remove smoke and heat in the event of a fire.

IDENTIFICATION OF ASSETS IS A KEY FACTOR IN MEETING STATUTORY REQUIREMENTS



SMOKE CONTROL ASSETS AND SYSTEMS

COMPONENTS / ASSETS

A fire safety product should perform in the way it was designed to, in the environment it was expected to operate in. It is critical that the functional requirements and the performance characteristics of the fire safety product (asset) are established and recorded. For instance an automatic opening vent in a corridor typically needs to open automatically on the floor where smoke is initially detected and is required to achieve a specified geometric or aerodynamic free area of ventilation. This type of information is known as the **essential characteristics of the product**. Any such values or data should relate to the original design intent set out in the fire strategy (**Approved Document B** or a fire engineered design) and should be recorded against the individual asset along with other key information such as the location of the asset. It is important to establish how each asset interacts with other components (e.g. as part of a system) and the last known / next due maintenance dates.

Note: A schedule of Essential Characteristics for smoke control system components (assets) is available in **chapter 8 of the SCA's Guidance on Smoke Control to Common Escape Routes in Apartment Buildings (Revision 3.1; July 2020)** available for download from [Smoke Control Association](#)

SYSTEMS

Fire safety assets often work with other passive or active fire safety products to achieve an overall design objective. For instance fire separation between zones or floors may be achieved through a combination of passive measures (e.g. fire resistance rated walls and fire doors) and active measures such as controlling smoke control dampers and AOVs so that they only open on the fire floor and actively close vents or dampers on the non-fire floors.

As a minimum, the information required to support a smoke control system should include the asset register, unique asset identification, location (block, floor, zone), the cause and effect schedule and the system design containing functional requirements for each asset (the essential characteristics).

UNDERSTANDING HOW THE SMOKE CONTROL ASSETS INTERACT WITH OTHER SYSTEMS IS A KEY FACTOR IN UNDERSTANDING HOW THE BUILDING WILL PERFORM IN A FIRE SITUATION



MAINTENANCE RECOMMENDATIONS

The SCA wishes to emphasise the significance of the collaborative relationship between the Building Representative and the Competent Maintainer, highlighting the importance of documentation, risk assessments, and regular checks of third-party systems. This document is aimed at ensuring that smoke control systems operate effectively and safely. The guidance offers a streamlined approach for stakeholders to maintain compliance and uphold occupant safety through diligent maintenance practices.

- *The Building Representative should provide the Competent Maintainer with the system design, drawings, records of issues reported by management / staff, cause and effect, fire strategy, flow rates for any dampers / fans, non-conformities.* This is so that the Competent Maintainer can check system performance and functionality against original system specification. If no original design / performance criteria is available, the competent maintainer should check that there is a recent Fire Risk Assessment confirming that the system is appropriate.
- Upon acquiring or taking over a building, it is critical to align the smoke control system's maintenance with BS 7346 standards. *The Building Representative should start by securing all necessary documentation, including system design, installation records, and maintenance logs, to understand the system's specifications and performance criteria.*
The Building Representative should then conduct or acquire a current Fire Risk Assessment to verify the system's effectiveness and regulatory compliance.
If documentation is lacking, ensure that a survey is immediately commissioned by a Competent Maintainer to map the system's original design and assess its compliance with the relevant standards. This should be followed by a tailored Fire Risk Assessment to identify and remedy any deficiencies, ensuring the system meets the building's needs and legal standards. The Building Representative should maintain detailed records of these actions for future reference and compliance, establishing a comprehensive framework for the system's ongoing management and safety.
- Any Risk Assessment of a maintenance activity should include working practices as well as operational risks, such as:
 - The isolation of any linked life safety systems whilst building is occupied (e.g. fire alarms, door access).
 - Access to vents (e.g. vents over / near stairwells).
 - Environmental factors (e.g. wind, rain).

This Guidance acknowledges that the Accountable Person (as defined in the Building Safety Act 2022 referring to High Rise Residential Buildings) has the same duties as the Building Representative (as defined in the Regulatory Reform (Fire Safety Order) 2005). This Guidance refers to anyone with responsibility for / control of the premises as the Building Representative.

- The Building Representative should ensure that any third-party systems that interact with the smoke control system have regular maintenance carried out by a competent person in accordance with the approved schedules and make testing records available for inspection by the smoke control maintainer. For example, this can include:
 - A valid Electrical Installation Certificate (EIC) or Electrical Installation Condition Report (EICR)
 - A valid fire detection system certificate
 - A valid sprinkler system certificate
 - Access control system certificate
- As far as is reasonably practicable, the competent maintainer should assess whether any part of the system has been modified and report any potential issues.
- *If any part of the system has been exposed to heat from a fire incident and / or fire and smoke above its classified operating temperature, it should be evaluated by a competent maintainer to determine whether it requires replacement.*

REGULAR MAINTENANCE OF SYSTEMS IS A KEY FACTOR IN MEETING STATUTORY REQUIREMENTS



SMOKE CONTROL SYSTEM INSPECTION SCHEDULES

The following statutory and national guidance maintenance intervals are the minimum recommended inspection intervals. All systems are subject to daily, weekly and monthly inspection by a Building Representative or their nominated competent person, who has sufficient training and knowledge of the building to carry out the task. 3 monthly and 6 monthly checks are also outlined below. The Annual Maintenance check should be carried out by a certified organisation.

Note: Smoke Control systems are susceptible to interference by third parties, and this can affect the operation of the system. The Building Representative should take into account the Risk Assessment, complexity of the building and systems, users and operation when constructing a maintenance schedule. Where there is an elevated risk, The Smoke Control Association recommends that more frequent inspections of the system should be carried out by a competent SDI19 certified organisation, above the levels recommended in statutory and national guidance.

Fire Safety (England) Regulations 2022 (Regulation 7) defines “routine check as follows: “a check that any lift or piece of equipment is in efficient working order and in good repair, carried out in accordance with the relevant industry standard or any recommendations made by the manufacturers of equipment within an operators’ manual.”

The Smoke Control Association and the manufacturer members within it recommend that 6 monthly inspection and maintenance should be carried out to identify unmonitored faults, take preventive measures and ensure the continued reliability of the system, and make the user aware of any changes to the building that affect the protection afforded by the system.



MECHANICAL SMOKE CONTROL SYSTEMS

INTERVAL	CARRIED OUT BY	CHECKS TO BE UNDERTAKEN
DAILY	Nominated Person	<ul style="list-style-type: none"> Inspect Smoke Control System status panel to ensure the control panel displays a clear indication of normal operation and the fire alarm system is active

- In the event of any faults, the issue is logged and resolved promptly.
- If the fault cannot be resolved, contact the Competent Maintenance Provider
- If the fault compromises system performance, then the Building Representative should review the Fire Risk Assessment and take action accordingly

WEEKLY	Nominated Person	<p>AS DAILY CHECKS PLUS:</p> <ul style="list-style-type: none"> Actuation of the system, as per the system provider recommendations. See Notes 1 & 2. Check all Smoke Control status panels and Firefighter's Switches for fault indication. Ensuring that any fans/powered exhaust ventilators operate as normal. Dampers for triggered zones open and close, natural exhaust ventilators open, automatic smoke curtains move into position, etc. Smoke control components for triggered zones operate correctly. Can the damper & vents be seen / heard opening and closing? Can the fan be heard operating? Are there any strange sounds? Has the air inlet (vent/window/door) opened as well as the exhaust/outlet damper? Is there air movement toward and into the smoke shaft via the damper? On reset, have the fans turned off and all dampers & vents fully closed? Example testing schedule provided at Table 1
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Note 1: As per BS 9999 Annex I.5 *the actuation of all zones within a smoke control system should be simulated at least once every three months, with tests run each week (BS 9999, Annex I.3.5). An example schedule of testing a typical residential building can be seen below in Table 1. Guidance from the system provider should be sought for more complex buildings / designs.*

Note 2: Care should be taken when testing smoke control systems that are interfaced to other building systems. If the smoke control system is linked to another system, an assessment should be carried out to review any effects on linked systems. Procedures may need to be implemented to safeguard people and / or linked systems whilst smoke control testing is carried out.

- The system logbook should be examined. It should be ensured that any faults recorded have received appropriate attention.
- Any fault recorded previously that has not been fixed, is reported to the MMO (see Glossary).
- If the fault compromises system performance, then the Building Representative should review the Fire Risk Assessment and take action accordingly.
- A detailed record should be kept with systems logbook of each test, along with the date and time that it was conducted. See Appendix C for example system logbook.

Table 1 Schedule of Testing Example

1-5 Storey Building	1-10 Storey Building	1-15 Storey Building	1-20 Storey Building
Test 1 zone per week	Test 2 zones per week	Test 3 zones per week	Test 4 zones per week

Each floor/storey could be made up of multiple zones

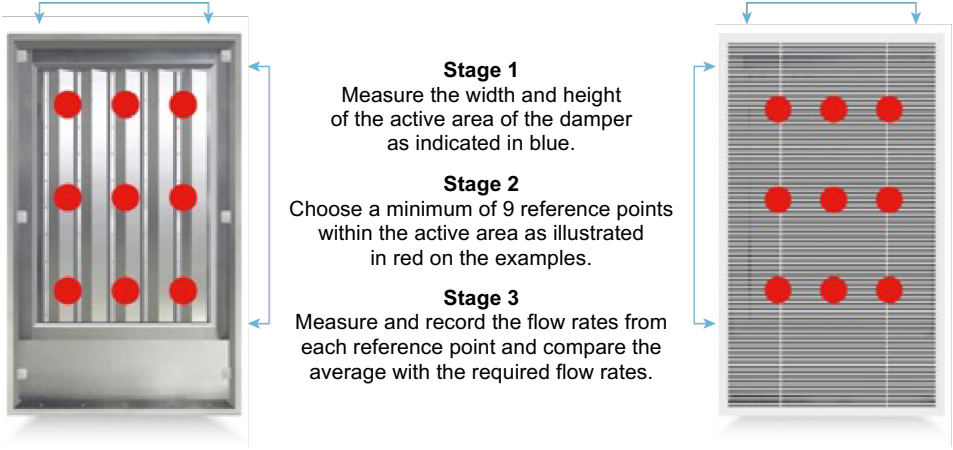


MECHANICAL SMOKE CONTROL SYSTEMS		
INTERVAL	CARRIED OUT BY	CHECKS TO BE UNDERTAKEN
MONTHLY	Competent Person	In accordance with the Fire Safety (England) Regulations 2022 (Regulation 7) the Responsible Person in relation to a high-rise residential building must undertake monthly routine checks of... essential fire fighting equipment within the building... "routine check" means a check that any lift or piece of equipment is in efficient working order and in good repair.
MONTHLY	Competent Person	AS WEEKLY CHECKS PLUS: <ul style="list-style-type: none">▪ A thorough inspection of all rooftop equipment. Check for debris ingress (where applicable), wear, corrosion, tampering, signs of vermin, no overgrown vegetation or combustible materials or any other anomalies / obstruction.▪ Door hold-open devices on the system should all be checked for correct operation once a month by simulating failure of the mains power supply or operation of the fire detection and fire alarm system.▪ Run fans to ensure all duty and standby fans have each totalled 20 min run time. This can be via a single test or accumulated run time throughout the month.▪ Simulate the failure of primary power supply and run system on secondary supply for at least one hour. At the end of test;<ul style="list-style-type: none">– Ensure all supplies have been restored to their standby position– For systems with secondary supply via standby generators;<ul style="list-style-type: none">○ Check fuel tank and ensure there is sufficient fuel for 72 hours operation in standby plus 3 hours operation at full load.○ Top-up fuel tanks as required.○ Check generator controls for any fault indications.– For systems with secondary supply via UPS;▪ Check UPS controls for any fault indications.
A detailed record should be kept with systems logbook of each test, along with the date and time that it was conducted. See Appendix C for example system logbook.		
3 MONTHLY	Competent Person	AS MONTHLY CHECKS PLUS: <ul style="list-style-type: none">▪ Ensure that all zones have been independently tested. See Note 1 under Weekly Inspections above <i>Ensure all parts of the entire smoke control system have been tested, including all fire detection inputs and control interfaces</i>
A detailed record should be kept with systems logbook of each test, along with the date and time that it was conducted. See Appendix C for example system logbook.		
6 MONTHLY	Nominated Person	If there is an ATS installed, check that the ATS has been maintained in accordance with manufacturers intervals. <i>If not known, this should be maintained at least annually.</i>
Ensure a service report dated within the appropriate time period is available. If the ATS has not been fully tested and passed (i.e. only a visual inspection has taken place) this should be recorded on the smoke control system inspection report.		



MECHANICAL SMOKE CONTROL SYSTEMS		
INTERVAL	CARRIED OUT BY	CHECKS TO BE UNDERTAKEN
6 MONTHLY	Competent Maintainer	<ul style="list-style-type: none"> ▪ The system logbook should be reviewed for any recorded observations and that regular user checks have been conducted. ▪ It is good practice for the competent maintainer to check the amount of operations and runtime on fan system drives to ensure they have been operated regularly in accordance with the Weekly / Monthly checks, <i>if these checks are not appearing to be made this needs to be identified on any reporting.</i> ▪ Cause and effects should be checked to ensure they still function as per the original design <p>Where the smoke control system provides other building functions (e.g. environmental conditioning, such as corridor ventilation), <i>check that all cause and effects still function as per the original design.</i> Typically, the environmental functionality will be isolated, and environmental dampers would normally close.</p> <ul style="list-style-type: none"> ▪ Power supplies should be checked to ensure that when the primary power is removed, the secondary supply transfers correctly. ▪ Check that the ATS has a service report dated within the last 12 months. The ATS should be checked to ensure it is still in the original configuration (i.e. if it was originally a dual supply, it has not been changed to a single supply). ▪ LV supplies should be checked to ensure appropriate protective devices are installed and that no earth leakage protection devices are present within these circuits. <p>The supply to the controller should be of a “secure” or “unswitched” type. Unsecure types such as a switched fused spur are not acceptable.</p> <p>Secondary supplies should be checked as follows:</p> <ul style="list-style-type: none"> ▪ UPS – maintainer should review the most recent UPS service report which should be dated within the last 12 months. ▪ Panel batteries (excluding those within an enclosed UPS system); <ul style="list-style-type: none"> – Are no more than 3 years from date of manufacture, unless manufacturer datasheet confirms an extended interval is appropriate. – If the batteries are not dated, they should be replaced and labelled with the installation date. – All batteries are to be tested via the use of an approved test method, such as an intelligent battery tester. Any batteries that fail testing should be replaced. ▪ Unless stated otherwise by the manufacturer, the PLC battery should be replaced every 2 years. ▪ All fault monitoring functions operate correctly on secondary supply, e.g. by simulation of fault conditions. <p>The competent maintainer should take and record a representative sample of the flow rate for smoke dampers or doors. Flow rates should be measured on at least the damper or door located at the top, middle, and bottom of the shaft. Typically, <i>9 Measurements should be taken as per Figure 1, unless superseded by any SCA guidance issued after this documents issue date:</i></p>



MECHANICAL SMOKE CONTROL SYSTEMS		
INTERVAL	CARRIED OUT BY	CHECKS TO BE UNDERTAKEN
6 MONTHLY (Continued)	Competent Maintainer (Continued)	<p>Figure 1 – as per 2023 guidance</p>  <p>Stage 1 Measure the width and height of the active area of the damper as indicated in blue.</p> <p>Stage 2 Choose a minimum of 9 reference points within the active area as illustrated in red on the examples.</p> <p>Stage 3 Measure and record the flow rates from each reference point and compare the average with the required flow rates.</p> <p>Measurements are to be taken via an appropriate Anemometer or similar airflow measuring device of at least 100mm in diameter and only internal aperture size to be utilised for flowrate calculations. All data should be recorded by the maintainer for any future inspection or reference point.</p> <p><i>Temperature and ambient barometric pressure should also be recorded alongside the flow rate to allow corrections for prevailing environmental conditions.</i></p> <ul style="list-style-type: none"> Fan testing should at a minimum include the testing procedures laid out in the Smoke Control Association & Fan Manufacturers' Association Guide, Smoke extract fan maintenance; Best practice guide ensuring that your life safety equipment is fit for purpose. Any specific fan tests as recommended by the manufacturer in the O&M manual should be carried out in addition to the tests referred to above. The results of the flow testing should be recorded, and the record should show the comparison with the design flow rates expected.
<p>A detailed record should be kept with systems logbook of each test, along with the date and time that it was conducted. See Appendix C for example system logbook.</p> <p>8. A Maintenance Certificate should be issued to the Building Representative confirming the functional integrity of the system and its compliance with the established performance criteria.</p> <p>9. The Maintenance Certificate should clearly state whether the system has passed testing, passed testing with advisories, or failed testing. The Smoke Control Association has designed a model maintenance certificate at Appendix B which can be used as the basis for an inspection / servicing certificate.</p>		
ANNUAL	Certified SDI19 Organisation	<p>AS 6 MONTHLY CHECKS PLUS:</p> <ul style="list-style-type: none"> A full commissioning check should be undertaken and checked against the system design Check all cause and effects, fire strategy, non-conformities, system performance and functionality against original system specification. The system components should be checked to ensure they still function as per the original design. Where the smoke control system provides other building functions (e.g. environmental conditioning, such as corridor ventilation), check that each zone performs in accordance with the cause & effect when the smoke control system is activated. Typically, the environmental functionality will be isolated, and environmental dampers would normally close.



ANNUAL (Continued)	Certified SDI19 Organisation (Continued)	<ul style="list-style-type: none">▪ Critical considerations:<ul style="list-style-type: none">– Inspect shaft doors / dampers for correct operation, that intumescent seals are present and no obvious signs of damage.– Check that all vents meet the functional performance requirement (e.g. free area requirement of Approved Document B).– Check that window vents are higher than 1100 mm from floor level. There should be adequate fall protection provided if not– Check rooftop vents open fully– <i>Check shaft has not had any utility services / equipment installed that is not part of the smoke control system</i>▪ <i>Check cable installation is as per ADB, BS 8519, BS 7671 and SCA Guidance including cable installation is as per ADB, BS 8519, BS 7671 and SCA Guidance.</i>▪ All smoke control ducts and smoke shafts must be cleaned at least annually in accordance with the applicable standards outlined in BS 9991:2024. Certificates of cleaning must be provided to the smoke control engineer to validate and pass the smoke control system.
<p><i>10. An annual joint inspection visit is recommended with other maintenance providers to ensure that the interaction with any third-party systems function as intended, e.g. fire alarm smoke detection activating specific smoke control zones.</i></p> <p>11. A Maintenance Certificate should be issued to the Building Representative confirming the functional integrity of the system and its compliance with the established performance criteria.</p> <p>12. The Maintenance Certificate should clearly state whether the system has passed testing, passed testing with advisories, or failed testing. The Smoke Control Association has designed a model maintenance certificate at Appendix B which can be used as the basis for an inspection / servicing certificate.</p> <p>13. Component intervals – where a smoke control system has integrated detection, detectors over 10 years old are checked and replaced, unless manufacturer datasheet confirms a shorter interval is appropriate.</p>		



NATURAL SMOKE CONTROL SYSTEMS				
INTERVAL	CARRIED OUT BY	CHECKS TO BE UNDERTAKEN		
DAILY	Nominated Person	<ul style="list-style-type: none">Inspect Smoke Control System status panel to ensure the control panel displays a clear indication of normal operation and the fire alarm system is active		
<div>1. In the event of any faults, the issue is logged and resolved promptly</div> <div>2. If the fault cannot be resolved, contact the Competent Maintenance Provider.</div> <div>If the fault compromises system performance, then the Building Representative should review the Fire Risk Assessment and take action accordingly.</div>				
WEEKLY	Competent Person	AS DAILY CHECKS PLUS: <ul style="list-style-type: none">Actuation of the system, as per the system provider recommendations. See Notes 1 & 2.Check all Smoke Control status panels and Firefighter's Switches for fault indication.Dampers for triggered zones open and close, natural exhaust ventilators open, automatic smoke curtains move into position, etc.Can the damper & vents be seen / heard opening and closing?Are there any strange sounds?Investigate any issues and resolve if possible. If faults persist, log details in logbook and if necessary, escalate to maintenance providerOn reset, have all dampers & vents fully closed? Example testing schedule provided at Table 1		
<div>Note 1: As per BS 9999 Annex I.5 the actuation of all zones within a smoke control system should be simulated at least once every three months, with tests run each week (BS 9999, Annex I.3.5).An example schedule of testing a typical residential building can be seen below in Table 1. Guidance from the system provider should be sought for more complex buildings / designs.</div> <div>Note 2: Care should be taken when testing smoke control systems that are interfaced to other building systems. If the smoke control system is linked to another system, an assessment should be carried out to review any effects on linked systems. Procedures may need to be implemented to safeguard people and / or linked systems whilst smoke control testing is carried out.</div> <div>3. The system logbook should be examined. It should be ensured that any faults recorded have received appropriate attention.</div> <div>4. Any fault recorded previously that has not been fixed, is reported to the MMO.</div> <div>5. If the fault compromises system performance, then the Building Representative should review the Fire Risk Assessment and take action accordingly.</div> <div>6. A detailed record should be kept with systems logbook of each test, along with the date and time that it was conducted. See Appendix C for example system logbook.</div>				
Table 1 Schedule of Testing Example		1-5 Storey Building	1-10 Storey Building	1-15 Storey Building
		Test 1 zone per week	Test 2 zones per week	Test 3 zones per week
				1-20 Storey Building
				Test 4 zones per week
Each floor/storey could be made up of multiple zones				
MONTHLY	Competent Person	In accordance with the Fire Safety (England) Regulations 2022 (Regulation 7) the Responsible Person in relation to a high-rise residential building must undertake monthly routine checks of... essential fire fighting equipment within the building... "routine check" means a check that any lift or piece of equipment is in efficient working order and in good repair.		
MONTHLY	Competent Person	AS WEEKLY CHECKS PLUS		



NATURAL SMOKE CONTROL SYSTEMS		
INTERVAL	CARRIED OUT BY	CHECKS TO BE UNDERTAKEN
		<ul style="list-style-type: none"> A thorough inspection of all AOV's and Control Panels. Check for external debris ingress (where applicable), wear, corrosion, tampering, signs of vermin and any other anomalies. Door hold-open devices on the system should all be checked for correct operation once a month by simulating failure of the mains power supply or operation of the fire detection and fire alarm system. Simulate the failure of primary power supply and operate system on secondary supply. At the end of test; <ul style="list-style-type: none"> Ensure all supplies have been restored to their standby position. For systems with secondary supply via UPS; <ul style="list-style-type: none"> Check UPS controls for any fault indications.
A detailed record should be kept with systems logbook of each test, along with the date and time that it was conducted. See Appendix C for example system logbook.		
3 MONTHLY	Competent Person	AS MONTHLY CHECKS PLUS Ensure all parts of the entire smoke control system have been tested, including all fire detection inputs and control interfaces.
A detailed record should be kept with systems logbook of each test, along with the date and time that it was conducted. See Appendix C for example system logbook.		
6 MONTHLY	Competent Person	<ul style="list-style-type: none"> The system logbook should be reviewed for any recorded observations and that regular user checks have been conducted. <i>All cause and effects should be checked to ensure they still function as per the original design.</i> Where the smoke control system provides other building functions (e.g. environmental conditioning, such as corridor ventilation), <i>check that all cause and effects still function as per the original design.</i> Typically, the environmental functionality will be isolated, and environmental dampers would normally close. Check condition of actuators to determine any signs of wear and tear, lubricate where applicable. Check shaft components for any visible gaps / damage. Power supplies should be checked to ensure that when the primary power is removed, the secondary supply transfers correctly. LV supplies should be checked to ensure that there are no earth leakage protection devices within the LV distribution circuits. An appropriate protective device should be present. The supply to the controller should be of a "secure" or "unswitched" type. Unsecure types such as a switched fused spur are not acceptable. <p>Secondary supplies should be checked as follows:</p> <ul style="list-style-type: none"> UPS – maintainer should review the most recent UPS service report which should be dated within the last 12 months. Panel batteries (excluding those within an enclosed UPS system); <ul style="list-style-type: none"> Are no more than 3 years from date of manufacture, unless manufacturer datasheet confirms an extended interval is appropriate. If the batteries are not dated, they should be replaced and labelled with the installation date. All batteries are to be tested via the use of an approved test method, such as an intelligent battery tester. Any batteries that fail testing should be replaced. Unless stated otherwise by the manufacturer, the PLC battery should be replaced every 2 years. <p>All fault monitoring functions operate correctly on secondary supply, e.g. by simulation of fault conditions.</p>
6 MONTHLY (Continued)	Competent Person (Continued)	



NATURAL SMOKE CONTROL SYSTEMS		
INTERVAL	CARRIED OUT BY	CHECKS TO BE UNDERTAKEN
<p>7. A detailed record should be kept with systems logbook of each test, along with the date and time that it was conducted. See Appendix C for example system logbook.</p> <p>8. A inspection record should be made or a Certificate should be issued to the Building Representative confirming the functional integrity of the system and its compliance with the established performance criteria.</p> <p>9. The Maintenance Certificate should clearly state whether the system has passed testing, passed testing with advisories, or failed testing. The Smoke Control Association has designed a model maintenance certificate at Appendix B which can be used as the basis for an inspection / servicing certificate.</p>		
ANNUAL	Certified SDI19 Organisation	<p>AS 6 MONTHLY CHECKS PLUS</p> <ul style="list-style-type: none">▪ <i>A full commissioning check should be undertaken</i>▪ Check all cause and effects, fire strategy, non-conformities, system performance and functionality against original system specification. The system components should be checked to ensure they still function as per the original design.▪ Where the smoke control system provides other building functions (e.g. environmental conditioning, such as corridor ventilation), check that each zone performs in accordance with the cause & effect when the smoke control system is activated. Typically, the environmental functionality will be isolated, and environmental dampers would normally close.▪ Critical considerations:<ul style="list-style-type: none">– Inspect shaft doors / dampers for correct operation, that intumescent seals are present and no obvious signs of damage.– Check that all vents meet the functional performance requirement (e.g. free area requirement of Approved Document B)– Check that window vents are higher than 1100 mm from floor level. There should be adequate fall protection provided if not– Check rooftop vents open fully– <i>Check shaft has not had any utility services / equipment installed that is not part of the smoke control system</i>▪ <i>Check cable installation is as per ADB, BS 8519, BS 7671 and SCA Guidance including cable installation is as per ADB, BS 8519, BS 7671 and SCA Guidance.</i>▪ All smoke control ducts and smoke shafts must be cleaned at least annually in accordance with the applicable standards outlined in BS 9991:2024. Certificates of cleaning must be provided to the smoke control engineer to validate and pass the smoke control system.
<p>10. A record should be kept with systems logbook of each test, along with the date and time that it was conducted. See Appendix C for example system logbook</p> <p>11. If a fault is identified, notify Building Representative to review building fire risk assessment and take action accordingly.</p> <p>12. A Maintenance Certificate should be issued to the Building Representative confirming the functional integrity of the system and its compliance with the established performance criteria.</p> <p>13. <i>The Maintenance Certificate should clearly state whether the system has passed testing, passed testing with advisories, or failed testing.</i> The Smoke Control Association has designed a model maintenance certificate at Appendix B which can be used as the basis for an inspection / servicing certificate</p> <p>14. Component intervals – where a smoke control system has integrated detection, detectors over 10 years old are checked and replaced, unless manufacturer datasheet confirms a shorter interval is appropriate.</p>		



PRESSURE DIFFERENTIAL SMOKE CONTROL SYSTEMS

INTERVAL	CARRIED OUT BY	CHECKS TO BE UNDERTAKEN			
DAILY	Nominated Person	<ul style="list-style-type: none">Inspect Smoke Control System status panel to ensure the control panel displays a clear indication of normal operation and the fire alarm system is active			
<div>1. In the event of any faults, the issue is logged and resolved promptly</div> <div>2. If the fault cannot be resolved, contact the Competent Maintenance Provider.</div> <div>3. If the fault compromises system performance, then the Building Representative should review the Fire Risk Assessment and take action accordingly.</div>					
WEEKLY	Competent Person	<p>AS DAILY CHECKS PLUS:</p> <ul style="list-style-type: none">Actuation of the system, as per the system provider recommendations. See Notes 1 & 2.Check all Smoke Control status panels and Firefighter's Switches for fault indication.Ensure fans/powered exhaust ventilators operate as normal and has been maintained in accordance with manufacturers Installation, Operating and maintenance instructions.Dampers for triggered zones open and close, Pressure Relief Dampers open etc.Smoke control components for triggered zones operate correctly.Can damper & vents be seen or heard opening/closing?Can the fan be heard operating?Are there any strange sounds?Has the air inlet opened?Do the pressure relief vents open when compartment doors are closed?Is there noticeable air movement when compartment doors are opened?On reset, have the fans turned off and all dampers & vents fully closed? <p>Example testing schedule provided at Table 1</p>			
<p>Note 1: As per BS 9999 Annex I.5 <i>the actuation of all zones within a smoke control system should be simulated at least once every three months</i>, with tests run each week (BS 9999, Annex I.3.5). An example schedule of testing a typical residential building can be seen below in Table 1. Guidance from the system provider should be sought for more complex buildings / designs.</p> <p>Note 2: Care should be taken when testing smoke control systems that are interfaced to other building systems. If the smoke control system is linked to another system, an assessment should be carried out to review any effects on linked systems. Procedures may need to be implemented to safeguard people and / or linked systems whilst smoke control testing is carried out.</p> <div>4. The system logbook should be examined. It should be ensured that any faults recorded have received appropriate attention.</div> <div>5. Any fault recorded previously that has not been fixed, is reported to the MMO.</div> <div>6. If the fault compromises system performance, then the Building Representative should review the Fire Risk Assessment and take action accordingly.</div> <div>7. A detailed record should be kept with systems logbook of each test, along with the date and time that it was conducted. See Appendix C for example system logbook.</div>					
Table 1 Schedule of Testing Example		1-5 Storey Building	1-10 Storey Building	1-15 Storey Building	1-20 Storey Building
		Test 1 zone per week	Test 2 zones per week	Test 3 zones per week	Test 4 zones per week
Each floor/storey could be made up of multiple zones					



PRESSURE DIFFERENTIAL SMOKE CONTROL SYSTEMS		
INTERVAL	CARRIED OUT BY	CHECKS TO BE UNDERTAKEN
MONTHLY	Competent Person	In accordance with the Fire Safety (England) Regulations 2022 (Regulation 7) the Responsible Person in relation to a high-rise residential building must undertake monthly routine checks of... essential fire fighting equipment within the building... "routine check" means a check that any lift or piece of equipment is in efficient working order and in good repair.
MONTHLY	Competent Person	AS WEEKLY CHECKS PLUS <ul style="list-style-type: none"> ▪ A thorough inspection of all rooftop AOV's and Control Panels. Check for external debris ingress (where applicable), wear, corrosion, tampering, signs of vermin and any other anomalies. ▪ Door hold-open devices on the system should all be checked for correct operation once a month by simulating failure of the mains power supply or operation of the fire detection and fire alarm system. ▪ Run fans to ensure all duty and standby fans have each totalled 20 min run time. This can be via a single test or accumulated run time throughout the month. ▪ Simulate the failure of primary power supply and run system on secondary supply for at least one hour. At the end of test; <ul style="list-style-type: none"> – Ensure all supplies have been restored to their standby position – For systems with secondary supply via standby generators; <ul style="list-style-type: none"> ○ Check fuel tank and ensure there is sufficient fuel for 72 hours operation in standby plus 3 hours operation at full load. ○ Top-up fuel tanks as required. ○ Check generator controls for any fault indications. – For systems with secondary supply via UPS; ▪ Check UPS controls for any fault indications.
A detailed record should be kept with systems logbook of each test, along with the date and time that it was conducted. See Appendix C for example system logbook.		
3 MONTHLY	Competent Person	AS MONTHLY CHECKS PLUS <ul style="list-style-type: none"> ▪ Ensure that each zone has been independently tested. See Note 1 under Weekly Inspections above ▪ Ensure all parts of the entire smoke control system have been tested, including all fire detection inputs and control interfaces.
A detailed record should be kept with systems logbook of each test, along with the date and time that it was conducted. See Appendix C for example system logbook.		
6 MONTHLY	Competent Person	<ul style="list-style-type: none"> ▪ If there is an ATS installed, check that the ATS has been maintained in accordance with manufacturers intervals. If not known, this should be maintained at least annually.
Ensure a service report dated within the appropriate time period is available. If the ATS has not been fully tested and passed (i.e. only a visual inspection has taken place) this will be recorded on the smoke control system inspection report.		
6 MONTHLY	Competent Person	AS 3 MONTHLY CHECKS PLUS: <ul style="list-style-type: none"> ▪ The system logbook should be reviewed for any recorded observations and that regular user checks have been conducted. ▪ It is good practice to check the amount of operations and runtime on fan system drives to ensure they have been operated regularly in accordance



PRESSURE DIFFERENTIAL SMOKE CONTROL SYSTEMS		
INTERVAL	CARRIED OUT BY	CHECKS TO BE UNDERTAKEN
6 MONTHLY (Continued)	Competent Person (Continued)	<p>with the Weekly / Monthly checks, <i>if these checks are not appearing to be made this needs to be identified on any reporting.</i></p> <ul style="list-style-type: none"> ▪ <i>All cause and effects should be checked to ensure they still function as per the original design.</i> ▪ Where the smoke control system provides other building functions (e.g. environmental conditioning, such as corridor ventilation), check that each zone performs in accordance with the cause & effect when the smoke control system is activated. Typically, the environmental functionality will be isolated, and environmental dampers would normally close. ▪ Power supplies should be checked to ensure that when the primary power is removed, the secondary supply transfers correctly. ▪ Check that the ATS has a service report dated within the last 12 months. The ATS should be checked to ensure it is still in the original configuration (i.e. if it was originally a dual supply, it has not been changed to a single supply). ▪ LV supplies should be checked to ensure that there are no earth leakage protection devices within the LV distribution circuits. An appropriate protective device should be present. ▪ The supply to the controller should be of a “secure” or “unswitched” type. Unsecure types such as a switched fused spur are not acceptable. <p>Secondary supplies should be checked as follows:</p> <ul style="list-style-type: none"> ▪ UPS – maintainer should review the most recent UPS service report which should be dated within the last 12 months. ▪ Panel batteries (excluding those within an enclosed UPS system); <ul style="list-style-type: none"> – Are no more than 3 years from date of manufacture, unless manufacturer datasheet confirms an extended interval is appropriate. – If the batteries are not dated, they should be replaced and labelled with the installation date. – All batteries are to be tested via the use of an approved test method, such as an intelligent battery tester. Any batteries that fail testing should be replaced. ▪ Unless stated otherwise by the manufacturer, the PLC battery should be replaced every 2 years. ▪ All fault monitoring functions operate correctly on secondary supply, e.g. by simulation of fault conditions. ▪ Take a representative sample of the flow rates for smoke dampers or doors. These measurements should be taken as per BS EN 12101-13:2022 Section 8.5.2 ▪ Equipment used for site measurement should conform to 12101-13:2022 Section 8.2.3 Accuracy of test equipment. ▪ Environmental conditions should be recorded in accordance with BS EN 12101-13:2022, 8.2.2 Climatic conditions during measurement ▪ Fan testing should at a minimum include the testing procedures laid out in the <i>Smoke Control Association & Fan Manufacturers’ Association Guide, Smoke extract fan maintenance; Best practice guide ensuring that your life safety equipment is fit for purpose.</i> ▪ Any specific fan tests as recommended by the manufacturer in the O&M manual should be carried out in addition to the tests referred to above. <p>A record should be kept with the systems logbook of each test result, along with the date and time that it was conducted. See Appendix E for example system logbook.</p>



PRESSURE DIFFERENTIAL SMOKE CONTROL SYSTEMS

INTERVAL	CARRIED OUT BY	CHECKS TO BE UNDERTAKEN
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| 8. | A detailed record should be kept with systems logbook of each test, along with the date and time that it was conducted. See Appendix C for example system logbook. | |
| 9. | A Maintenance Certificate should be issued to the Building Representative confirming the functional integrity of the system and its compliance with the established performance criteria. | |
| 10. | The Maintenance Certificate should clearly state whether the system has passed testing, passed testing with advisories, or failed testing. The Smoke Control Association has designed a model maintenance certificate at Appendix B which can be used as the basis for an inspection / servicing certificate | |

Ensure a service report dated within the appropriate time period is available. If the ATS has not been fully tested and passed (i.e. only a visual inspection has taken place) this will be recorded on the smoke control system inspection report.

INTERVAL	CARRIED OUT BY	CHECKS TO BE UNDERTAKEN
ANNUAL	Certified SDI19 Organisation	AS 6 MONTHLY CHECKS PLUS: <ul style="list-style-type: none">A full commissioning check should be undertaken in accordance with BS EN 12101-13:2022, Section 8, recording all critical measurable elements against the design criteria. These will typically include but are not limited to:<ul style="list-style-type: none">8.2.2 Climatic conditions during measurement8.2.3 Accuracy of test equipment8.3 Tests8.4 Minimum number of tests8.5 Test procedures<ul style="list-style-type: none">8.5.1 Pressure differential test8.5.2 Air velocity test8.5.3 Static door opening force test8.5.4 Test of dynamic response time of the PDS8.5.5 Activation of the system test8.5.6 Initiation time and operation timeCheck all cause and effects, fire strategy, non-conformities, system performance and functionality against original system specification. The system components should be checked to ensure they still function as per the original design.Where the smoke control system provides other building functions (e.g. environmental conditioning, such as corridor ventilation), check that each zone performs in accordance with the cause & effect when the smoke control system is activated. Typically, the environmental functionality will be isolated, and environmental dampers would normally close.Critical considerations:<ul style="list-style-type: none">Inspect shaft doors / dampers for correct operation, that intumescent seals are present and no obvious signs of damage.Check that all vents meet the functional performance requirement (e.g. free area requirement of Approved Document B)Check that window vents are higher than 1100 mm from floor level. There should be adequate fall protection provided if notCheck rooftop vents open fully<i>Check shaft has not had any utility services / equipment installed that is not part of the smoke control system</i><i>Check cable installation is as per ADB, BS 8519, BS 7671 and SCA Guidance including cable installation is as per ADB, BS 8519, BS 7671 and SCA Guidance.</i>All smoke control ducts and smoke shafts must be cleaned at least annually in accordance with the applicable standards outlined in BS 9991:2024. Certificates of cleaning must be provided to the smoke control engineer to validate and pass the smoke control system.



PRESSURE DIFFERENTIAL SMOKE CONTROL SYSTEMS

INTERVAL	CARRIED OUT BY	CHECKS TO BE UNDERTAKEN
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11. A detailed record should be kept with systems logbook of each test, along with the date and time that it was conducted. See Appendix C for example system logbook.
12. A Maintenance Certificate should be issued to the Building Representative confirming the functional integrity of the system and its compliance with the established performance criteria.
13. Component intervals – where a smoke control system has integrated detection, detectors over 10 years old are checked and replaced, unless manufacturer datasheet confirms a shorter interval is appropriate.

The Maintenance Certificate should clearly state whether the system has passed testing, passed testing with advisories, or failed testing. The Smoke Control Association has designed a model maintenance certificate at Appendix B which can be used as the basis for an inspection / servicing certificate.



MECHANICAL CAR PARK VENTILATION SYSTEMS

Version 1.0 20

SCA Advice & Best Practice Quote from referenced doc Statutory Compliance Reqs.

Mechanical car park ventilation systems can be designed under a number of categories as defined in BS 7346-7. For guidance purposes in this document the categories are as follows

CAT A – Smoke Control/Enhanced – Systems that provide clear access for the fire fighters or are designed to protect lobbies and escape routes.

CAT B – Smoke Clearance – Standard systems that are designed to clear the smoke from the car park only.

CAT C – Vehicle Exhaust Pollution Control - where the openings are sufficient to allow the smoke to clear naturally and mechanical ventilation is for minimising the buildup, and removal of vehicle exhaust emission within the facility.

INTERVAL	CARRIED OUT BY	CHECKS TO BE UNDERTAKEN
DAILY	Nominated Person	<ul style="list-style-type: none">Inspect Smoke Control System status panel to ensure the control panel displays a clear indication of normal operation and the fire alarm system is active

1. In the event of any faults, the issue is logged and resolved promptly
2. If the fault cannot be resolved, contact the Competent Maintenance Provider.
3. If the fault compromises system performance, then the Building Representative should review the Fire Risk Assessment and take action accordingly.

WEEKLY CAT A&B	Competent Person	AS DAILY CHECKS PLUS: <ul style="list-style-type: none">Actuation of the system, as per the system provider recommendations. See Notes 1 & 2.Check all Smoke Control status panels and Firefighter's Switches for fault indication.Ensuring that all fans within the car park area and powered exhaust ventilators operate as normal.Automatic smoke curtains and roller shutters function as required.Smoke control components for specific zones operate correctly.Dampers for triggered zones open and close,Can the damper & vents be seen / heard opening and closing?Can the exhaust fans be heard operating?Are there any strange sounds?Is there sufficient inlet air available?Is there air movement toward and into the exhaust points?On reset, have the fans turned off and all dampers & vents returned to their standby position.
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Note 1: As per **BS 9999 Annex I.5** *the actuation of all zones within a smoke control system should be simulated at least once every three months*, with tests run each week (**BS 9999, Annex I.3.5**). An example schedule of testing a typical residential building can be seen below in Table 1. Guidance from the system provider should be sought for more complex buildings / designs.

Note 2: Care should be taken when testing smoke control systems that are interfaced to other building systems. If the smoke control system is linked to another system, an assessment should be carried out to review any effects on linked systems. Procedures may need to be implemented to safeguard people and / or linked systems whilst smoke control testing is carried out.

4. The system logbook should be examined. It should be ensured that any faults recorded have received appropriate attention.
5. Any fault recorded previously that has not been fixed, is reported to the MMO.
6. If the fault compromises system performance, then the Building Representative should review the Fire Risk Assessment and take action accordingly.
7. A detailed record should be kept with systems logbook of each test, along with the date and time that it was conducted. See Appendix C for example system logbook.

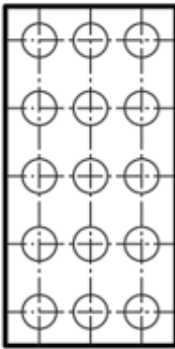
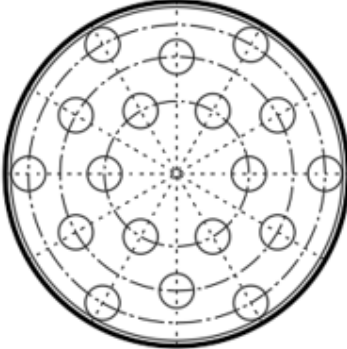


MECHANICAL CAR PARK VENTILATION SYSTEMS		
INTERVAL	CARRIED OUT BY	CHECKS TO BE UNDERTAKEN
MONTHLY	Competent Person	In accordance with the Fire Safety (England) Regulations 2022 (Regulation 7) the Responsible Person in relation to a high-rise residential building must undertake monthly routine checks of... essential fire fighting equipment within the building... "routine check" means a check that any lift or piece of equipment is in efficient working order and in good repair.
MONTHLY	Competent Person	AS WEEKLY CHECKS PLUS: <ul style="list-style-type: none">▪ A thorough inspection of all Control Panels. Check for external debris ingress (where applicable), wear, corrosion, tampering, signs of vermin and any other anomalies.▪ Run fans to ensure all duty and standby fans have each totalled 20 min run time. This can be via a single test or accumulated run time throughout the month.▪ Simulate the failure of primary power supply and run system on secondary supply for at least one hour. At the end of test;<ul style="list-style-type: none">– Ensure all supplies have been restored to their standby position– For systems with secondary supply via standby generators;<ul style="list-style-type: none">○ Check fuel tank and ensure there is sufficient fuel for 72 hours operation in standby plus 3 hours operation at full load.○ Top-up fuel tanks as required.○ Check generator controls for any fault indications.– For systems with secondary supply via UPS;<ul style="list-style-type: none">○ Check UPS controls for any fault indications.
A detailed record should be kept with systems logbook of each test, along with the date and time that it was conducted. See Appendix C for example system logbook.		
3 MONTHLY	Competent Person	AS MONTHLY CHECKS PLUS: <ul style="list-style-type: none">▪ Ensure that each zone has been independently tested. See Note 1 under Weekly Inspections above▪ Ensure all parts of the entire smoke control system have been tested, including all fire detection inputs and control interfaces.
A detailed record should be kept with systems logbook of each test, along with the date and time that it was conducted. See Appendix C for example system logbook.		
3 MONTHLY	Competent Person	AS MONTHLY CHECKS PLUS: <ul style="list-style-type: none">▪ Ensure that each zone has been independently tested. See Note 1 under Weekly Inspections above▪ Ensure all parts of the entire smoke control system have been tested, including all fire detection inputs and control interfaces.
A detailed record should be kept with systems logbook of each test, along with the date and time that it was conducted. See Appendix C for example system logbook.		
6 MONTHLY	Nominated Person	<ul style="list-style-type: none">▪ If installed, check that the ATS has been maintained in accordance with manufacturers intervals. If not known, this should be maintained at least annually.



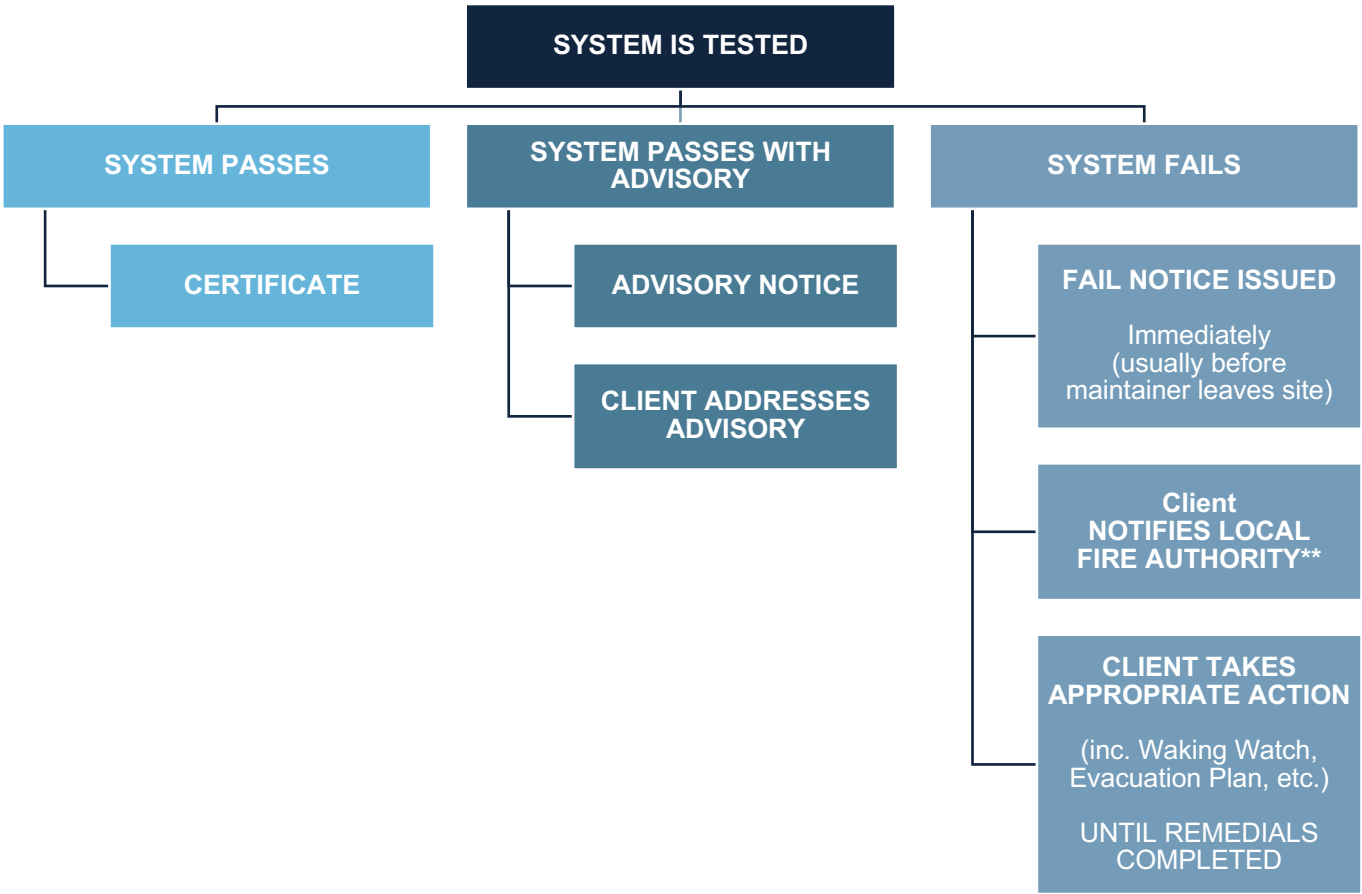
MECHANICAL CAR PARK VENTILATION SYSTEMS		
INTERVAL	CARRIED OUT BY	CHECKS TO BE UNDERTAKEN
Ensure a service report dated within the appropriate time period is available. If the ATS has not been fully tested and passed (i.e. only a visual inspection has taken place) this will be recorded on the smoke control system inspection report.		
6 MONTHLY CAT A, B & C	Competent Maintainer	<ul style="list-style-type: none">▪ The system logbook should be reviewed for any recorded observations and that regular user checks have been conducted.▪ It is good practice for the competent maintainer to check the amount of operations and runtime on fan system drives to ensure they have been operated regularly in accordance with the Weekly / Monthly checks, if these checks are not appearing to be made this needs to be identified on any reporting.▪ All cause and effects should be checked to ensure they still function as per the original design▪ Where the ventilation system provides other building functions, such as ventilation of vehicle exhaust pollution within the parking facility, check that each zone performs in accordance with the cause & effect when the ventilation system is activated.▪ Check environmental control sensors are working correctly, such as temperature, humidity, CO or NO2 sensors. Where applicable, adjust or calibrate accordingly.▪ Power supplies should be checked to ensure that when the primary power is removed, the secondary supply transfers correctly.▪ Check that the ATS has a service report dated within the last 12 months. The ATS should be checked to ensure it is still in the original configuration (i.e. if it was originally a dual supply, it has not been changed to a single supply).▪ LV supplies should be checked to ensure that there are no earth leakage protection devices within the LV distribution circuits. An appropriate protective device should be present.▪ The supply to the controller should be of a “secure” or “unswitched” type. Unsecure types such as a switched fused spur are not acceptable. <p>Secondary supplies should be checked as follows:</p> <ul style="list-style-type: none">▪ UPS - maintainer should review the most recent UPS service report which should be dated within the last 12 months.▪ Panel batteries (excluding those within an enclosed UPS system);<ul style="list-style-type: none">– Are no more than 3 years from date of manufacture, unless manufacturer datasheet confirms an extended interval is appropriate.– If the batteries are not dated, they should be replaced and labelled with the installation date.– All batteries are to be tested via the use of an approved test method, such as an intelligent battery tester. Any batteries that fail testing should be replaced.▪ Unless stated otherwise by the manufacturer, the PLC battery should be replaced every 2 years.▪ All fault monitoring functions operate correctly on secondary supply, e.g. by simulation of fault conditions. <p>The competent maintainer should take and record a representative sample of the flow rates for the main exhaust fans and supply air fans.</p>



MECHANICAL CAR PARK VENTILATION SYSTEMS		
INTERVAL	CARRIED OUT BY	CHECKS TO BE UNDERTAKEN
6 MONTHLY <i>CAT A, B & C</i> (Continued)	Competent Maintainer (Continued)	<div style="display: flex; justify-content: space-around; align-items: center;">   </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> Fig. 1 Fig. 2 </div> <p>Figure 1 and 2 for indication purposes – or as per 2023 guidance</p> <p>Measurements are to be taken via an appropriate Anemometer or similar airflow measuring device of at least 100mm in diameter over the inlet area for flowrate calculations. Depending on the installation type and arrangement the details in fig 1 and 2 are for indication purposes only. All data should be recorded by the maintainer for any future inspection or reference point. Temperature and ambient barometric pressure should also be recorded alongside the flow rate to allow corrections for prevailing environmental conditions.</p> <ul style="list-style-type: none"> ▪ Fan testing should at a minimum include the testing procedures laid out in the Smoke Control Association & Fan Manufacturers' Association Guide, Smoke extract fan maintenance; Best practice guide ensuring that your life safety equipment is fit for purpose. ▪ Any specific fan tests as recommended by the manufacturer in the O&M manual should be carried out in addition to the tests referred to above. ▪ The results of the flow testing should be recorded, and the record should show the comparison with the design flow rates expected.
<ol style="list-style-type: none"> 8. A detailed record should be kept with systems logbook of each test, along with the date and time that it was conducted. See Appendix C for example system logbook. 9. A Maintenance Certificate should be issued to the Building Representative confirming the functional integrity of the system and its compliance with the established performance criteria. 10. The Maintenance Certificate should clearly state whether the system has passed testing, passed testing with advisories, or failed testing. The Smoke Control Association has designed a model maintenance certificate at Appendix B which can be used as the basis for an inspection / servicing certificate. 		
ANNUAL	Certified SDI19 Organisation	AS 6 MONTHLY CHECKS PLUS: <ul style="list-style-type: none"> ▪ A full commissioning check should be undertaken.
<ol style="list-style-type: none"> 11. A detailed record should be kept with systems logbook of each test, along with the date and time that it was conducted. See Appendix C for example system logbook. 12. A Maintenance Certificate should be issued to the Building Representative confirming the functional integrity of the system and its compliance with the established performance criteria. 13. The Maintenance Certificate should clearly state whether the system has passed testing, passed testing with advisories, or failed testing. The Smoke Control Association has designed a model maintenance certificate at Appendix B which can be used as the basis for an inspection / servicing certificate. 14. Component intervals – where a smoke control system has integrated detection, detectors over 10 years old are checked and replaced, unless manufacturer datasheet confirms a shorter interval is appropriate. 		



APPENDIX A FAILURE FLOWCHART



ADVISORY	The system is functional but issues are identified that may affect performance within 12 months.
FAIL	The system fails to achieve the required performance criteria in any single smoke zone and therefore cannot fulfil it's functional requirements within the building or facility.

**** only in the case of High Rise Buildings, over 18 m**



APPENDIX B MAINTENANCE CERTIFICATE

Client:	
Site Address:	
Extent of system covered by the certificate:	<i>Provide details of kit that is covered, 1x controller, 1x override switch, 3x detectors, 2x dampers – also specify any interfaced equipment that is not covered</i>

■ SYSTEM PASS ■ SYSTEM PASS WITH ADVISORIES ■ SYSTEM FAIL

REGULATION 7 OF THE FIRE SAFETY (ENGLAND) REGULATIONS 2022 REQUIRES THAT ANY FAULTS ON SMOKE CONTROL SYSTEMS WITHIN A HRRB (BUILDINGS OVER 18M) TAKING LONGER THAN 24 HRS TO RECTIFY MUST BE REPORTED TO THE LOCAL FIRE AND RESCUE AUTHORITY

Confirm if this is the 6 monthly or annual check	6 / 12
Details of Equipment / Zones tested	
Have relevant details of the work carried out and any faults identified been entered into the system logbook?	Y / N
<i>Example – list any defects or remedial actions that need to be taken</i>	
Advisories not compliant with BS 7346: 2013 Part 8, Clause 9	
<i>Example – battery labels are not legible, cause and effects do not function as per design, secondary power does not operate when primary power is removed, modifications have been made without updating the system records, faults are not logged in the system logbook.</i>	

<small>I/we can confirm that I/we are the competent person(s) responsible for the servicing of the smoke control system, particulars of which are set above. I/we certify that the said work that has been carried out conforms to the best of my/our knowledge and belief of the BS 7346-8:2013, Clause 9, except for the variations, if any, stated in this certificate.</small>			
Name		Position	
Signature		Company	
Company Address			



APPENDIX C – EXAMPLE LOGBOOK

Address of protected premises	
Building Representative(s)	
Contact details	
Details of system (areas covered, linked systems)	<i>Note: Recommend one record log per system</i>
Type of system	

USEFUL CONTACTS (Example: Competent Maintainer, Managing Agents)			
Name	Company	Position	Telephone

KEY SYSTEM INFORMATION	
Locations of controls	
Function of override controls	
List of installed components	

SYSTEM SCHEMATIC HERE

Example from Figure C1 BS 7346:2013 Part 8

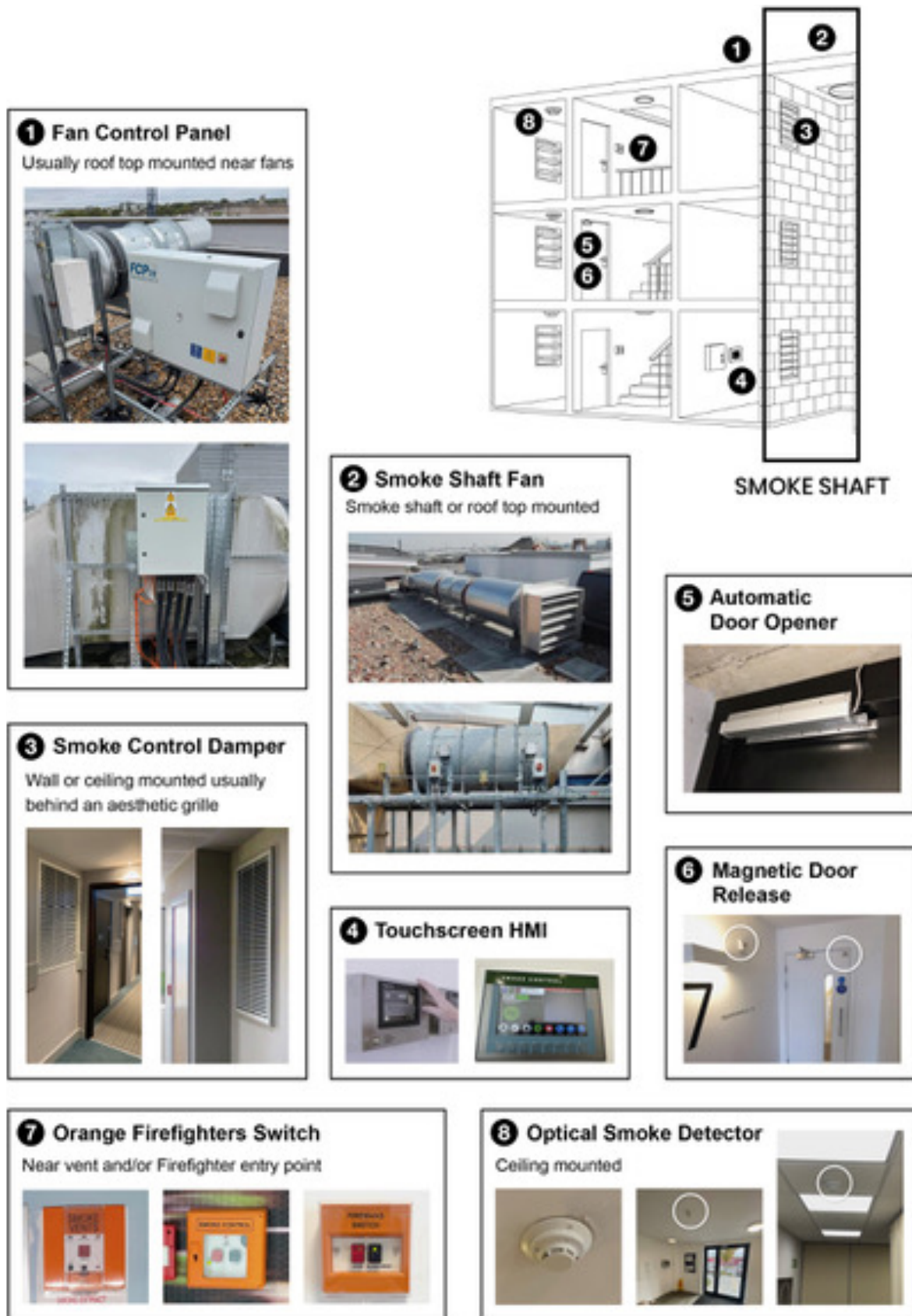
[illegible]

As per the Fire Safety Act 2021 Regulation 7, Buildings over 18m or 7 storeys in heights have a reporting requirement to the Local Fire and Rescue Service. If a fault cannot be repaired within 24 hours, the local Fire and Rescue Service must be notified. Once the repair has been carried out, this must be reported to the Fire and Rescue service to update their records.



APPENDIX D

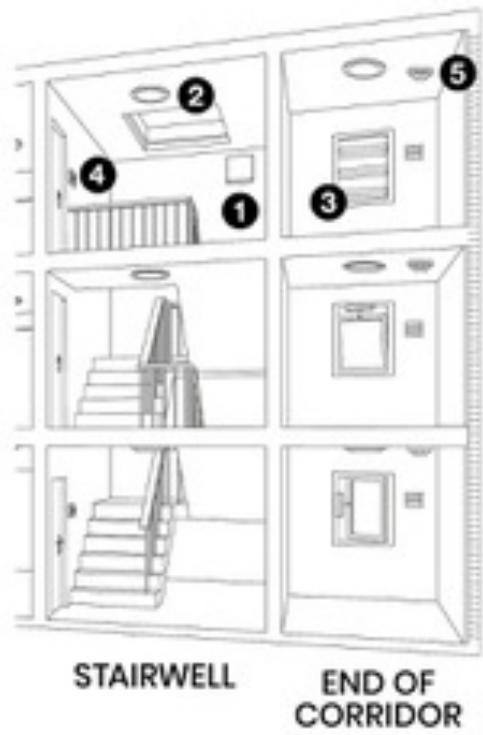
EXAMPLE OF MECHANICAL SYSTEM AND POTENTIAL ASSETS





EXAMPLE OF NATURAL SYSTEM AND POTENTIAL ASSETS

1 Control Panel
Wall or electrical riser mounted.



2 AOV Access Hatch



2 AOV Centre Pivot Window



2 AOV Louvre



3 End of Corridor AOV



4 Orange Firefighters Switch
Near vent and/or firefighter entry point



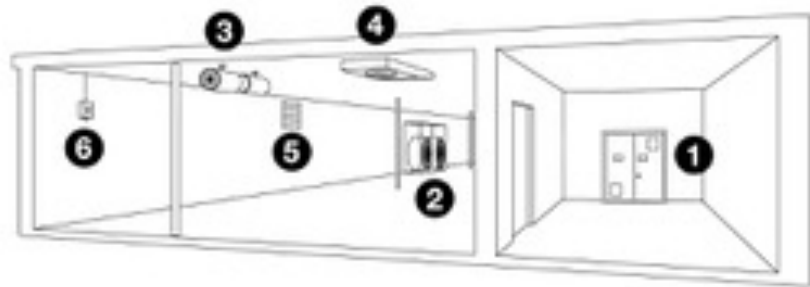
5 Optical Smoke Detector
Ceiling mounted





EXAMPLE OF CAR PARK SYSTEM AND POTENTIAL ASSETS

1 Fan Control Panel



2 Car Park Extract Fan



3 Jet Fan



4 Induction Fan



5 Damper



6 Vehicle Fume Detector





APPENDIX E – EXAMPLES OF SUBSTANDARD PRACTICE

1. REWINDING FAN MOTORS:

- **Issue:** Rewinding fan motors is a common practice aimed at cost-saving in HVAC applications. It involves taking the fan motor apart and replacing the copper coils and insulation in the motor.
- **Impact:** Changing the motor components in smoke control / life safety applications means that the assembly is no longer a certified product and may not perform to the intended level at the high temperatures of the original product. Only certified products should be used in smoke control systems (as per the **Construction Products Regulations 2013**).

2. USING NON-CERTIFIED REPLACEMENT PARTS:

- **Issue:** Utilising any replacement parts that are not certified, such as actuators or vent hinges.
- **Impact:** Non-certified parts might not withstand fire conditions, leading to system failure during emergencies. This can severely affect the system's reliability and is non-compliant with safety regulations.

3. HOLES IN WALLS WITHOUT FIRE STOPPING:

- **Issue:** Creating openings in compartment walls without proper fire stopping.
- **Impact:** This practice significantly reduces or negates the effectiveness of compartmentalisation, compromising the integrity of fire barriers in controlling fire and smoke spread.

4. REWIRING WITH INADEQUATE CABLING:

- **Issue:** Using cabling that does not meet the required fire-resistance.
- **Impact:** Inadequate or counterfeit cabling may fail under high temperatures, cutting off power to critical components of the smoke ventilation system. Cables for life safety and firefighting applications are tested for heat, water spray and impact over specific time periods to ensure that they are as resilient as possible for the application for which they are being used.

5. USING INADEQUATE SUPPORT FOR CABLING:

- **Issue:** Using fixings or containment that are not able to withstand heat.
- **Impact:** Inadequate fixings or support may cause cables to fall from walls or soffits under high temperatures, potentially entangling or causing obstructions to occupants and firefighters. Cables fixed to walls or soffits should have fire rated anchoring and/or supports so that they remain in place in the event of a fire.

6. NOT REPLACING COMPONENTS THAT HAVE PASSED THEIR LIFESPAN:

- **Issue:** Components such as batteries, detectors and sensors may all have a limited lifespan that is not always obvious.
- **Impact:** Expired components could lead to failure of part or the whole of the operation of the smoke control system. Failing to replace them once they have exceeded their lifespan can lead to system failure.

7. FAILURE TO CONDUCT REGULAR SYSTEM INSPECTIONS:

- **Issue:** Neglecting routine inspections and maintenance checks.
- **Impact:** This negligence may cause system failures or malfunctions during critical emergencies, as latent issues may go undetected. Ensuring regular inspections is crucial for identifying and rectifying new or existing system issues, thereby maintaining the system's operational integrity.

8. IMPROPER CALIBRATION OF CAR PARK SENSORS:

- **Issue:** Car Park Sensors not being calibrated correctly.
- **Impact:** Car Park Sensors require regular calibration and testing by a competent person during a maintenance visit. Inaccurate calibration can lead to false alarms or, more critically, failure to detect excess fumes. This delay in detection and response can compromise the safety of occupants and the effectiveness of the ventilation system. It is essential to only use correctly calibrated and appropriate testing equipment as indicated by the manufacturer's instructions, to maintain sensor reliability and system functionality.



9. IGNORING MANUFACTURER'S GUIDELINES:

- **Issue:** Disregarding the manufacturer's maintenance and operational guidelines.
- **Impact:** Non-compliance with these guidelines can compromise the system's intended performance, lead to premature wear and tear, operational inefficiencies, and potential system failures. Adhering to the manufacturer's instructions is crucial for maintaining the system's reliability and ensuring it performs optimally during emergencies.

10. USE OF NON-COMPETENT MAINTENANCE PERSONNEL / COMPANIES:

- **Issue:** Maintenance personnel lacking proper training, knowledge, skills and experience may not adhere to correct procedures or recognise signs of system degradation or carry out and test repairs safely.
- **Impact:** This can result in poor maintenance practices and unresolved issues, ultimately compromising the system's reliability. Personnel undertaking regular inspections as part of the premises management team as well as the Competent Maintainer need to demonstrate competence and have had sufficient training on the specific system they are working on. Ensuring that all maintenance personnel have received comprehensive training is essential to maintaining high standards of system care and operational readiness. The Competent Maintainer must have "*specialist knowledge of smoke control systems, adequate access to spares and sufficient information regarding the system*" as per **BS 7346 Part 8 2013 (Clause 9.1)**.

11. FAILURE TO UPDATE SYSTEM SOFTWARE/FIRMWARE:

- **Issue:** Modern smoke ventilation systems may require replacement parts that use a version of software that is different to the version of the firmware / software installed on the main smoke control system.
- **Impact:** Replacement components may not be compatible with older software versions, requiring an update of the entire system software to ensure system operating efficiency. Maintenance personnel need to be trained to correctly perform these updates as per the manufacturer recommendations and also to recognise signs of software incompatibility for new components. This will maintain optimal system functionality and ensure the system operates efficiently during emergencies.

12. NOT DOCUMENTING MAINTENANCE AND REPAIRS:

- **Issue:** Failing to keep detailed records of all maintenance and repairs.
- **Impact:** Without proper documentation, recurring issues may not be tracked, and the overall maintenance quality may decline. The "golden thread" principle, which involves keeping a digital record of crucial building information from the design phase throughout the building's life-cycle, requires that all activities are thoroughly documented. Maintaining comprehensive records is essential for identifying patterns of faults, ensuring accountability, and providing a reference for future maintenance activities. Proper documentation supports the long-term reliability and efficiency of the smoke ventilation system.

13. NEGLECTING VENTILATION PATHWAY CLEARANCES:

- **Issue:** Ventilation pathways being obstructed (e.g. by residents belongings or other services being installed).
- **Impact:** Obstructions can impede the flow of smoke and hot gases, reducing the system's efficiency in venting these away from escape routes. Regular inspections and maintenance to ensure pathways are unobstructed are crucial for the effective operation of the smoke ventilation system during emergencies. Maintaining clear ventilation pathways is essential for ensuring occupant safety and system performance.

14. NOT REPLACING DAMAGED PARTS ON FAN SYSTEMS

- **Issue:** Components are not replaced when damaged.
- **Impact:** Replacement of damaged / end of life components should be undertaken regularly and expediently, to ensure that system operates at maximum efficiency. For example, Banjo Bands not being replaced, which prevents system from achieving flow rates.

15. PLASTIC FAN ISOLATORS DAMAGED BY UV

- **Issue:** Plastic isolators damaged by UV light
- **Impact:** A damaged isolator may not provide safe isolation of the fan or may cause the circuit to fail and compromise the operation of the system.

16. INDICATOR LAMPS FAILED DUE TO AGE

- **Issue:** Lamps / bulbs have failed due to age

- 
- **Impact:** System status indication is a key factor in identifying faults on systems. These must be operational at all times, for both regular inspections and emergency identification.

17. FIREFIGHTER SWITCHES / CALLPOINT COVERS

- **Issue** Firefighter switches and callpoints with damaged housing and/or missing Housing covers.
- **Impact:** Damaged housing (or missing housing covers that permit unauthorised activation of any component within the smoke ventilation system) can potentially render part of or the entire system non-operational during a smoke event. Unauthorised activation may leave certain components of the system, such as an open smoke vent, vulnerable to potential structural damage from adverse weather conditions. It is imperative that any covers requiring replacement be addressed promptly to mitigate these risks.

18. DAMAGE/ BYPASS LOCK TO CONTROL PANEL DOORS

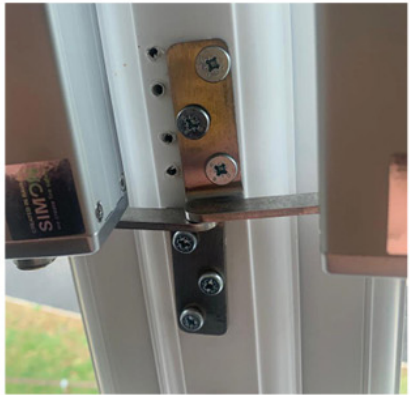
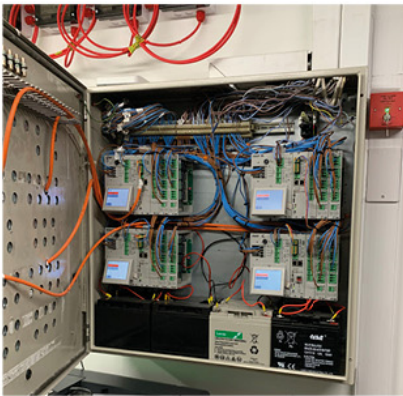
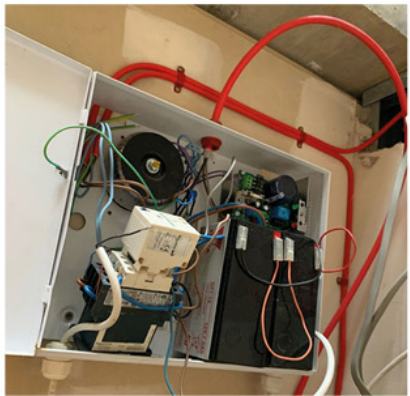
- **Issue:** Damage to control panel doors, e.g. by use of tools to open control panel doors instead of the proprietary panel key.
- **Impact:** Control panels accessed without the proper key can sustain damage to their mechanisms, resulting in the panel being left unlocked and vulnerable to interference and potential damage from unauthorised third parties. This situation poses a significant risk to users, as improper access could lead to electrocution hazards from misuse. Furthermore, bypassing the panel key may leave the system non-operational.

19. DELAY IN ACCEPTANCE OR AUTHORISATION OF SYSTEM REPAIRS

- **Issue:** Building Owners or Building Representatives may delay the acceptance or authorisation of repair quotes.
- **Impact:** Such delays in rectifying issues can adversely affect the operation and reliability of the system. Building Owners and Building Representatives have an obligation to take all necessary steps upon receiving a quote, which includes seeking alternative quotes if needed, promptly accepting and authorising the required work. Historically, these steps and processes have sometimes taken weeks, if not months, to action due to a disconnect regarding their importance and the individual responsible for authorising the works.



EXAMPLES





DISCLAIMER

Disclaimer – Guidance from FETA (Federation of Environmental Trade Associations)

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Bibliography

GUIDANCE ON MAINTENANCE OF SMOKE CONTROL EQUIPMENT – REFERENCES

LEGISLATION

- **Fire Safety Act 2021**
- **Fire Safety (England) Regulations 2022**
- **Building Safety Act 2022**
- **The Building Regulations 2010 No. 2214 (as amended)**
- **The Construction Products Regulation 2013 No. 1387**
- **The Construction (Design and Management) Regulations 2015 No. 320**
- **The Regulatory Reform (Fire Safety) Order 2005 No. 1541**
- **Approved Document B (Fire Safety):**
 - Volume 1 – Dwellings (2019 Edition), incorporating 2020 and 2022 amendments
 - Volume 2 – Buildings other than dwellings (2019 Edition), incorporating 2020 and 2022 amendments

STANDARDS

- **BS EN 12101 Series: Smoke and heat control systems**
 - **BS EN 12101-1:2020** – *Smoke barriers – Requirements and test methods*
 - **BS EN 12101-2:2003** – *Natural smoke and heat exhaust ventilators*
 - **BS EN 12101-3:2015** – *Powered smoke and heat control ventilators (Fans)*
 - **BS EN 12101-6:2022** – *Pressure differential systems – Kits*
 - **BS EN 12101-7:2011** – *Smoke duct sections*
 - **BS EN 12101-8:2011** – *Smoke control dampers*
 - **BS ISO 21927-9** – *Smoke and heat control systems. Specification for control equipment (alternative reference for EN 12101-9, not issued)*
 - **BS EN 12101-10:2005** – *Power supplies*
 - **BS EN 12101-13:2022** – *Pressure differential systems (PDS) – Design and calculation methods, installation, acceptance testing, routine testing, and maintenance*
- **BS 9991:2024** – Fire safety in the design, management, and use of residential buildings – Code of practice
- **BS 9999:2017** – Fire safety in the design, management, and use of buildings – Code of practice
- **BS 7346-7:2013** – Components for smoke and heat control systems – Code of practice for car parks

- **BS 7346-8:2013** – Components for smoke control systems – Code of practice for planning, design, installation, commissioning, and maintenance
- **BS 8519:2010** – Selection and installation of fire-resistant power and control cable systems for life safety and firefighting applications – Code of practice
- **BS 7671:2022** – Requirements for Electrical Installations (IET Wiring Regulations)

SCA GUIDANCE DOCUMENTS

The Smoke Control Association (SCA) provides industry-leading guidance on the design, maintenance, and operation of smoke control systems, ensuring compliance with fire safety regulations and best practices:

- **Smoke Control Association (SCA).** Guidance on Smoke Control to Common Escape Routes in Apartment Buildings (Flats and Maisonettes), Revision 3.1, 13 July 2020.
- **Smoke Control Association & Fan Manufacturers' Association (FMA).** Smoke Extract Fan Maintenance: Best Practice Guide to Ensuring Life Safety Equipment is Fit for Purpose, Version 5.5, November 2021.
- **Smoke Control Association (SCA).** Guidance for Electrical Control Equipment within Smoke and Heat Control Systems, Rev: 1.0, Issue Date: 11/12/2024.

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- **Hackitt, J. (2018).** *Building a Safer Future: Independent Review of Building Regulations and Fire Safety – Final Report.* Dame Judith Hackitt DBE FREng.
- **Chartered Institution of Building Services Engineers (CIBSE). (2019).** *Guide E: Fire Safety Engineering.*