SESSION 1

Regulations, Compliance & Standards

FIRE SAFETY WHEN CHARGING ELECTRIC VEHICLES (RC59)

Adrian Butler

ABOUT

FPA Fire Protection Association

RISCAuthority

RISCAuthority is a research scheme administered by the Fire Protection Association and supported by many UK insurers. Through the operation of its technical working groups, the scheme seeks to support measures that improve and promote property and business resilience measures.

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Synopsis

This presentation covers a hazard review and key guidance for charging EVs (electric vehicles) with lithium-ion batteries, from a fully revised and updated version of RISCAuthority RC59, and includes a review of major enclosed car park fires.

https://www.bangkokpost.com/thailand/general/1429518/porsche-catches-fire-while-charging

Adrian J. Butler

BSc (Hons) MSc (Eng) ACGI CEng MEI MSFPE ACII

Chartered Energy Engineer, Chartered Insurance Risk Manager

Principal Consultant

- Masters - Process Safety and Loss Prevention
- 40 years as a risk engineer and risk-control teams' manager in the insurance sector
- Risk surveys/ assessments around the world, delivering risk control advice to complex industrial and process facilities
- Convenor of the RISCAuthority Working Groups for risk control, security, and business continuity

THE HAZARD

Fire hazards relating to modern cars have changed over time due to:

- Larger vehicles with increased use of plastics and other combustible materials in construction
- Alternative fuels replacing internal combustion engines (ICE), i.e. EV, PHEVs and hydrogen cells

EV fire hazards:

- Highest risk of fire occurs when lithium-ion batteries are being charged, particularly if a cell is defective and unable to correctly convert the supplied electrical energy into stored chemical energy
- Even where an EV fire has apparently been extinguished, there have been cases when a vehicle lithium-ion battery has reignited due to the recurring thermal event in the battery. This may be exacerbated if the vehicle is disturbed/shaken by moving/dragging to another location
  Refer to: DoT “Recovery operators: working with electric vehicles”

Fire strategy:

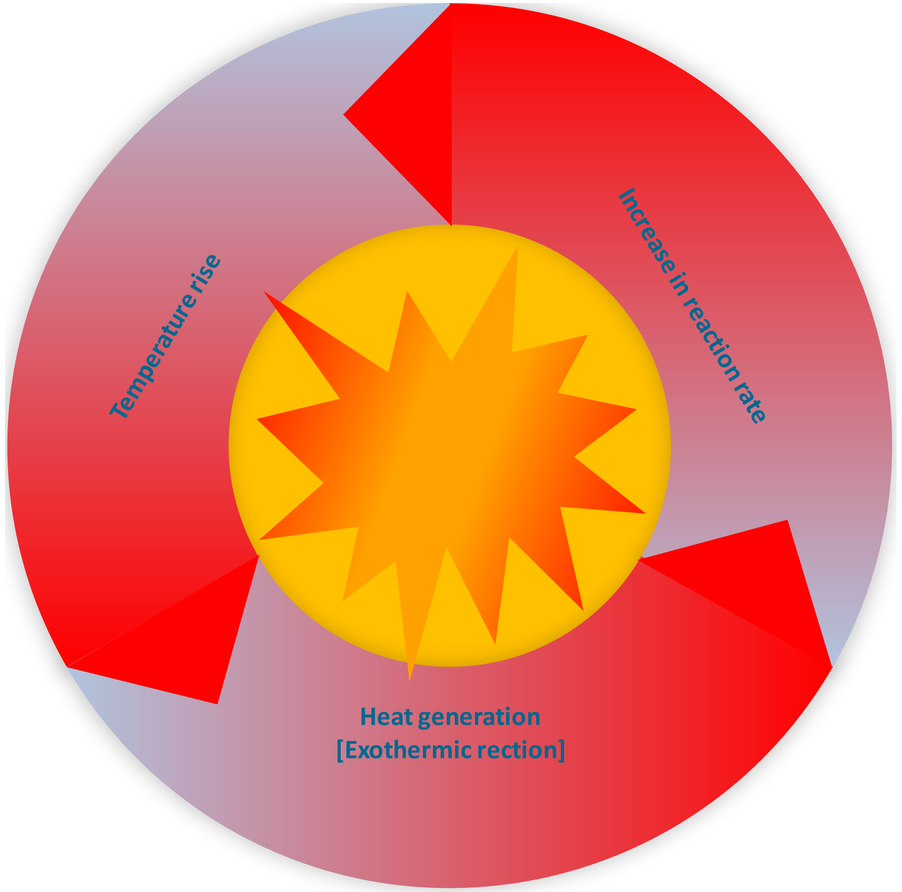
- Fire control strategies for EVs with lithium-ion batteries require combinations of containment, reduction of fire intensity by smothering (reducing oxygen levels) and cooling with water, to inhibit fire spread whilst the battery cell fires burn-out

Lithium-ion battery - Thermal runaway

If a battery cell creates more heat than it dissipates it can lead to a rapid uncontrolled release of heat energy, known as ‘thermal runaway’, that can result in a fire or explosion

This can occur as a result of:

- internal short circuit due to manufacturing defects
- “lithium plating” [formation of metallic lithium on an anode surface within a battery cell]
- mechanical damage
- exposure to heat from an external source
- overcharging, or over-discharging



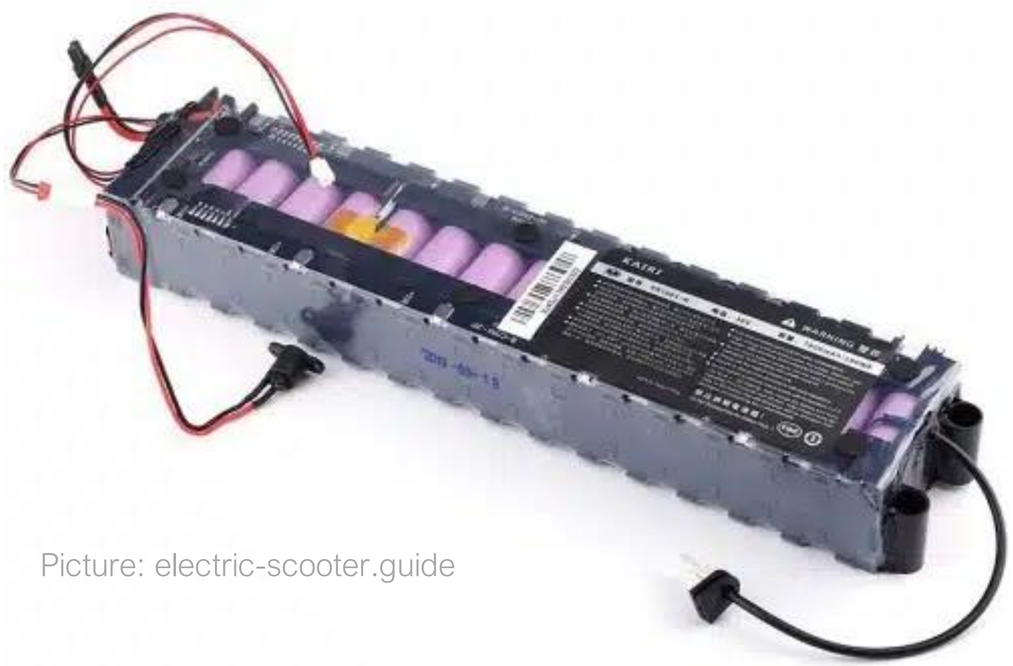
RE2 - Lithium-ion Battery Use and Storage

NEED TO KNOW GUIDE

This guide explains the hazards associated with the use and storage of lithium-ion batteries and provides good-practice risk control recommendations for typical situations covering:

- fire-safety considerations for general use
- manual control of small fires
- battery storage
- damaged or defective cells

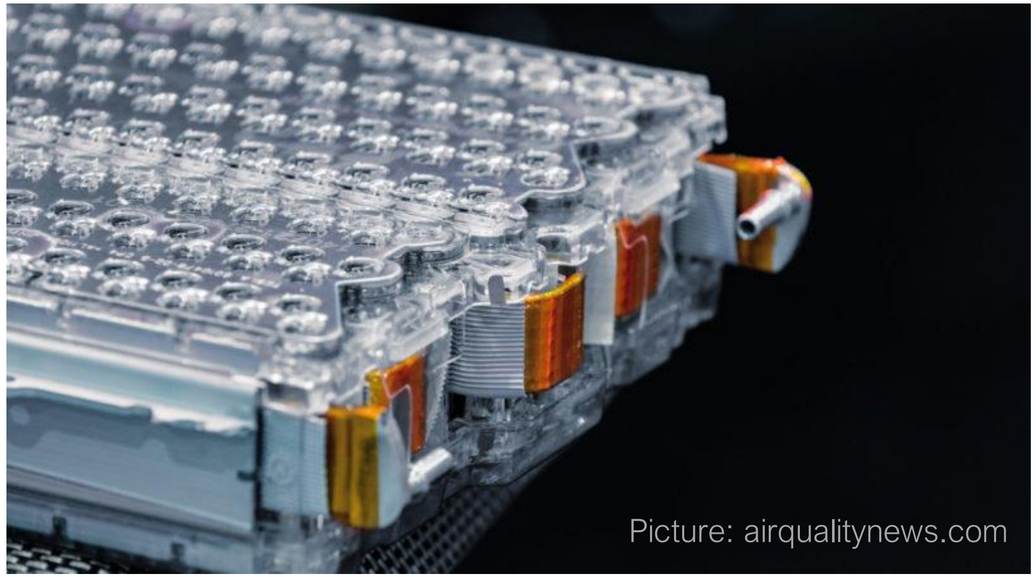
Lithium-ion battery cells' arrangement



Picture: electric-scooter.guide

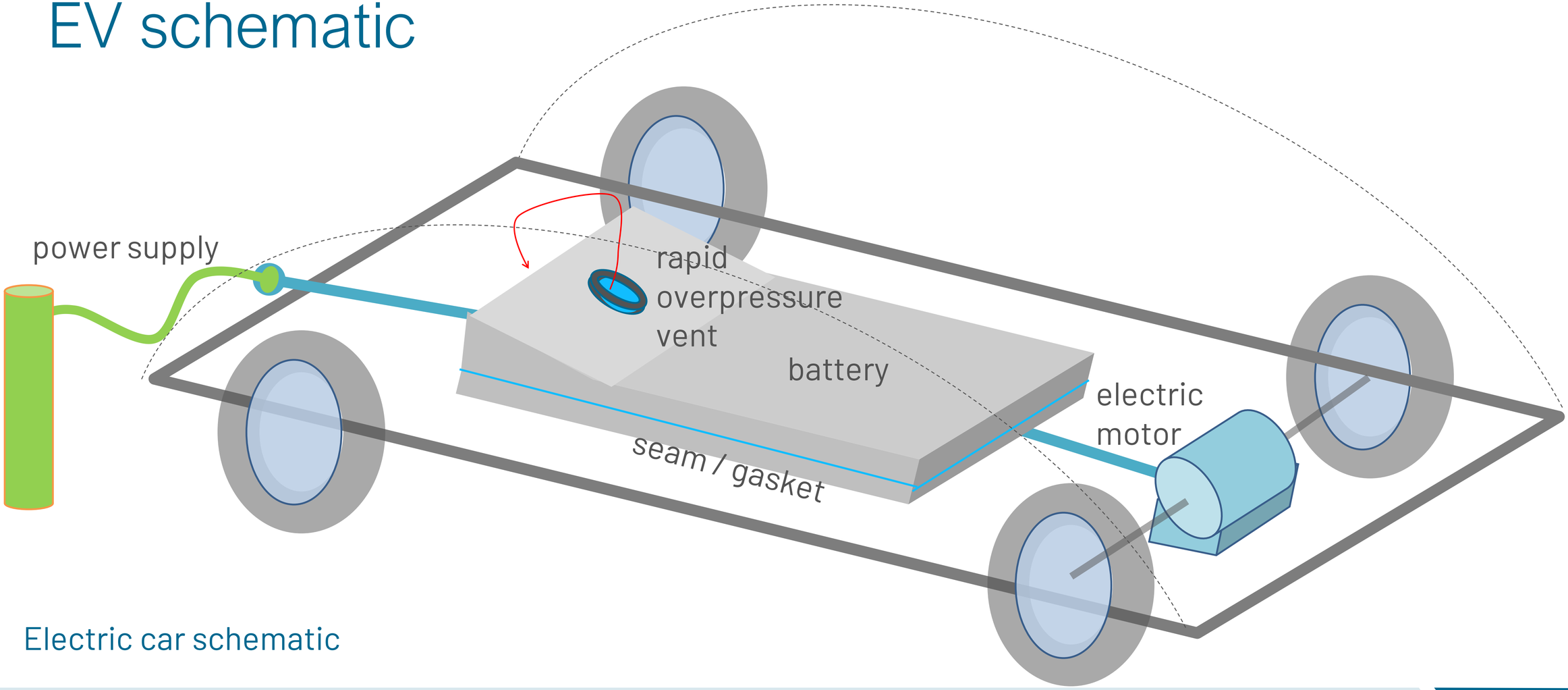
Example e-scooter batter pack

Electric-car batteries are typically made of several thousand individual cylindrical cells



Picture: airqualitynews.com

EV schematic



Electric car schematic

THE HAZARD

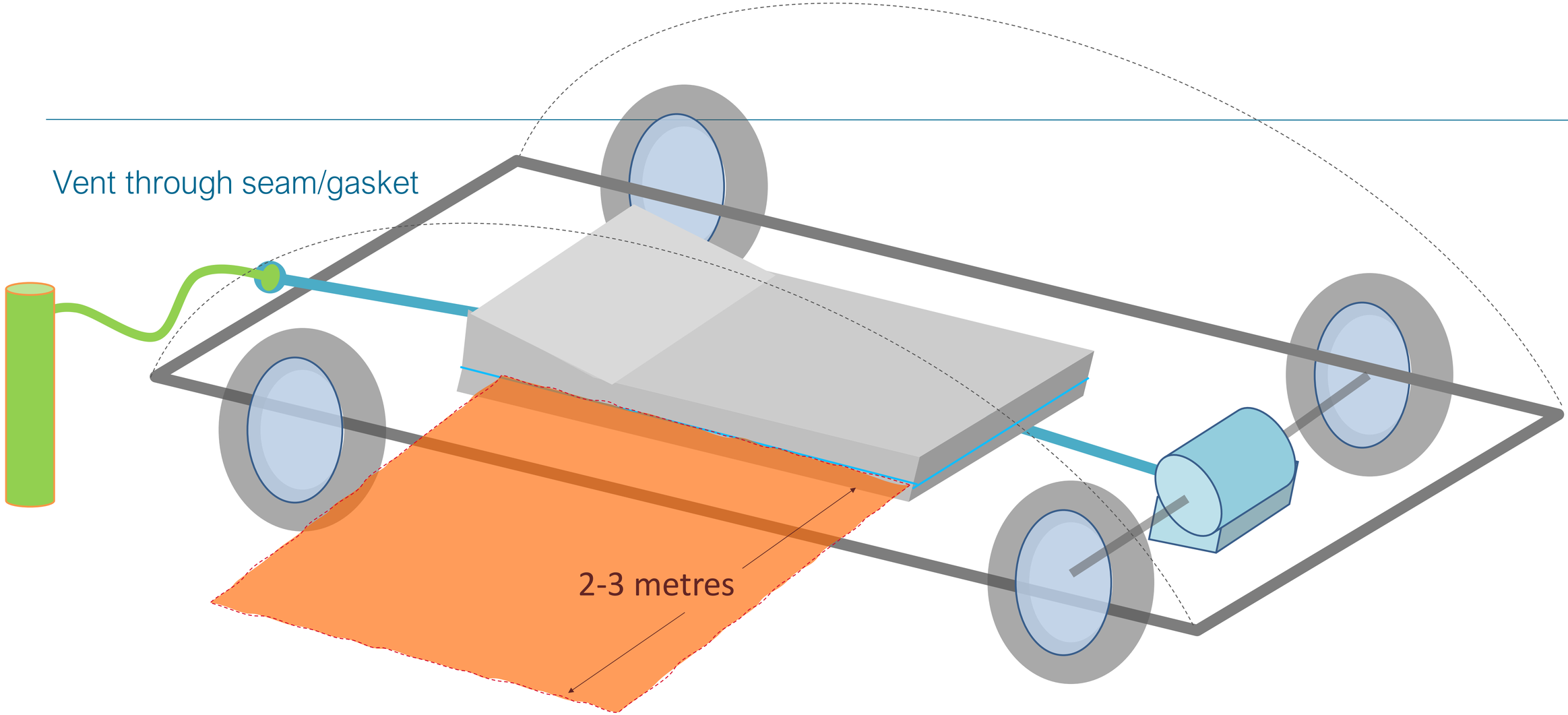
Lithium-ion EV batteries with defects or mechanical damage (possibly from a collision) may experience thermal runaway

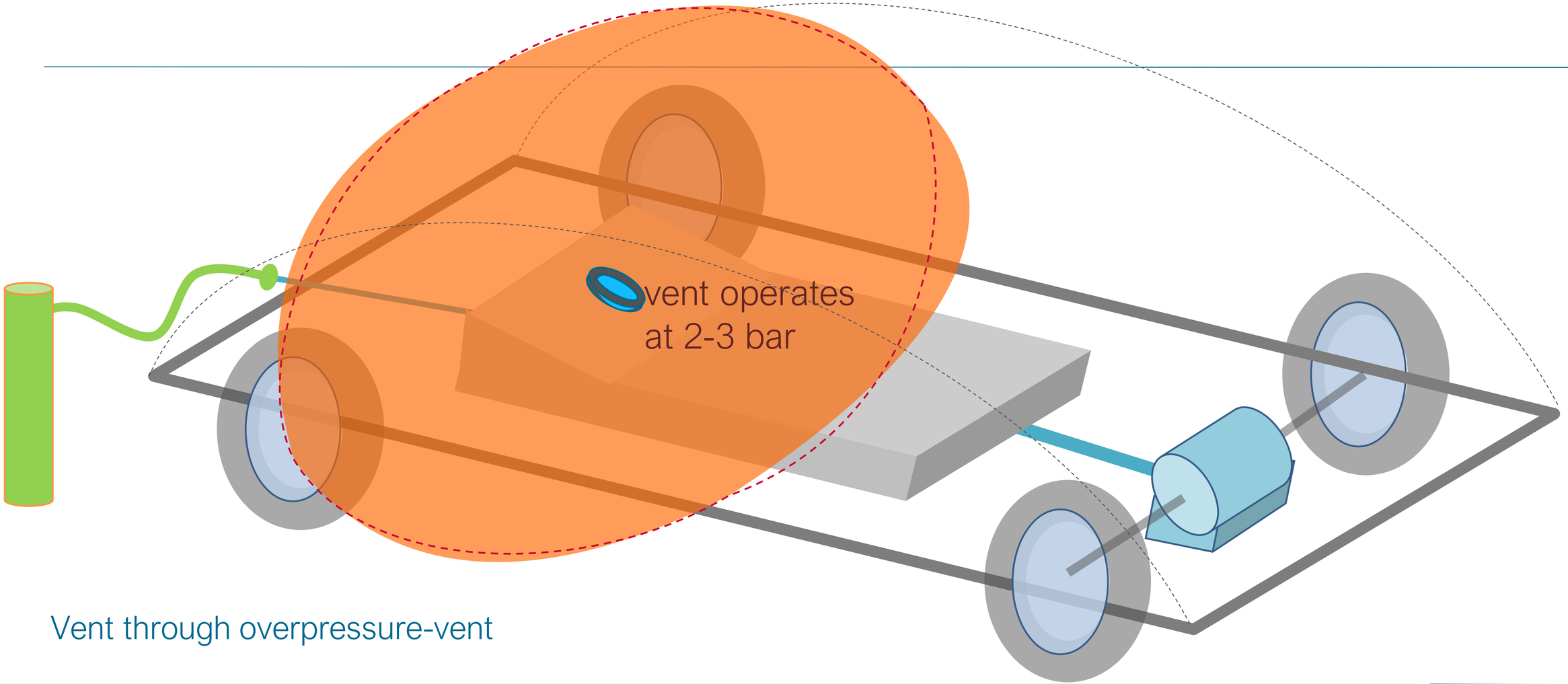
Batteries experiencing thermal runaway will typically either rupture or vent through integrated rupture discs, releasing a jet of flammable gases from the underside of the vehicle, igniting to form a short-duration jet-fire

EV car fire during charging

https://youtu.be/nsBgDXHVorE

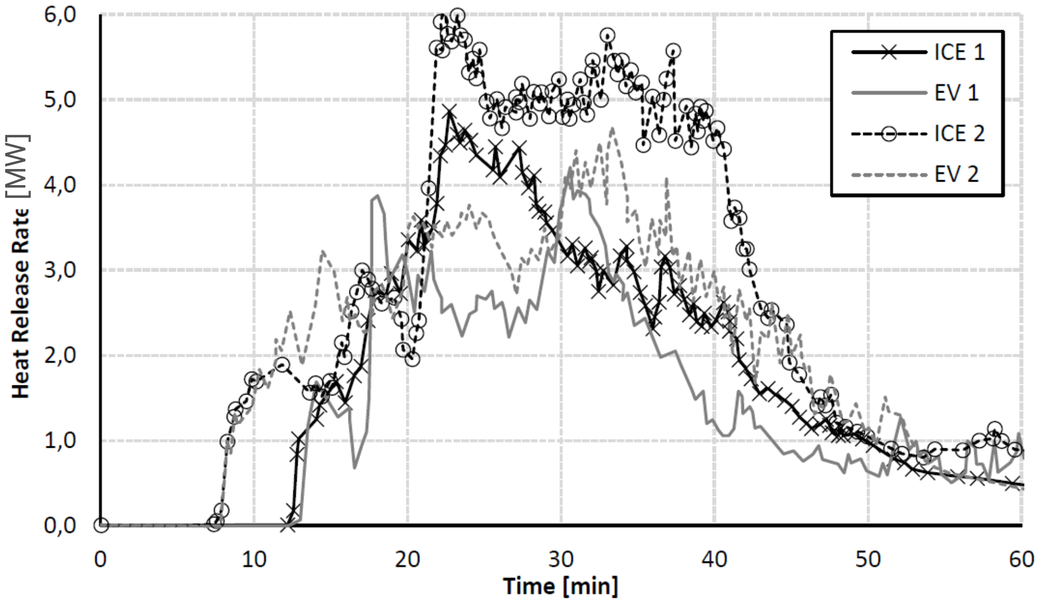
Vent through seam/gasket





Vent through overpressure-vent

EV fire risk – fire loading



Heat release rate for two pairs of similar ICE and EV vehicles for tests

Comparison of the fire consequences of an electric vehicle and an internal combustion engine vehicle, 2nd. International Conference on Fires In Vehicles, Lecocq, Truchot, Marlair (2012)

Studies by The Danish Institute of Fire and Security Technology and NFPA have both determined that EV car fires, once established, are largely fuelled by the car parts and interiors made from plastic materials and that fire loading is similar to that of internal combustion engine (ICE) vehicles

Battery EVs have a lower peak Heat Release Rate than an internal combustion engine (ICE).
Ignition and fire dynamics differ from an ICE fires

EV fire risk – knowledge & understanding

*“**Not more dangerous, but different***

In other words, it would be incorrect to conclude that there is a greater risk of fire with electric cars or that the risks are greater if they do catch fire. The risks are, however, different. If lithium-ion batteries short-circuit, cells can enter a state known as "thermal runaway," in which they continue heating up to a point where they can eventually ignite. It is difficult, however, to assess the status of a battery and they typically catch fire long after the initial damage has occurred”

RISE Sweden

It should be remembered that although similar, EV fires may burn for an extended period compared to ICE vehicle fires and once damaged lithium-ion batteries are inherently unstable and prone to re-ignition

The key to managing EV hazards is knowledge and understanding

Fire spread in car parks

Fire spread to adjacent cars

ICEs:
- Radiation
- Convection to a low ceiling
- Fuel leakage and running fuel (plastic fuel tanks are common)

Battery EVs:
- Radiation
- Convection to a low ceiling
- Jet flame

Image: BRE Group

Large multi-storey car park fires

Stavanger Airport, Norway – January 2020

Stavanger airport multi-story carpark; capacity 3,000 cars

RISE – Risk Institute of Sweden
https://www.youtube.com/watch?v=-6juEM8UTsc

Stavanger Airport Fire - timeline


Photo: Nordic Unmanned

➢ 0 minutes	Car starts burning
➢ 8.5 minutes	Alarm centre receives alarm
➢ 18 minutes	10 cars on fire
➢ 19.5 minutes	First two fire trucks arrive
➢ 27 minutes	All people are reported evacuated
➢ 82 minutes	All units told to exit the building
➢ 97 minutes	Parts of the building start to collapse
➢ 27 hours	Fire service leave the scene [incident terminated after 47 hours]

Stavanger Airport – Key facts

- The fire started in an older model diesel car, when the owner tried to start it
- Fire quickly spread to nearby cars
- Winds were strong, which exacerbated flames spread
- 300 cars destroyed
- Many of the vehicles EVs [Norway has the highest uptake of passenger EVs in Europe]
- From observations, EV & ICE vehicle contribution to fire spread was similar
- No sprinklers installed
- Fire fought with foam
- Fire Brigade were not familiar with the location of the fire hydrants
- In Norway, the pre-accepted performance level for the main loadbearing system of this structure was R90 (i.e. 90 minutes)

Liverpool Echo Arena, multi-storey car park December 2017

- Fire started in the engine bay of a parked Land Rover on third floor
- This car subsequently crashed down onto the level below

0 minutes	12 minutes	20 minutes
Car starts burning	First alarm call	Fire Brigade arrives

- All 1,400 cars destroyed
- Temperature in the car park reached circa 1,000°C
- Building had a substantial reinforced concrete frame which withstood the fire although there were collapses of some concrete floor slabs
- No sprinklers installed
- Twelve fire trucks and 85 firefighters were involved, including aerial appliances and three high-volume pumps

Ravenstein Street Parking Garage, November 2022

The Brussels Times, February 2022

"Brussels firefighters first answered an alarm for smoke inside the restaurant, …..in the centre of Brussels….. However, after not finding evidence of a fire in the restaurant, the firefighters quickly discovered the electric vehicle on fire in the garage below the restaurant

Firefighters found a large amount of heat and smoke emanating from the car and a thermal reaction in the car's battery. They placed the car into a large water container to fully extinguish the fire….. According to the owner of the car, it was not charging"

Examples of general recommendations

- Follow IET Code of Practice: EV Charging Equipment Installation/BS 7671 – 18th Edition wiring regulations, Section 722 (Electric Vehicle Charging Installations)
- For charging points in multi-storey car parks, give consideration to locating these in open areas with good access for fire-fighting
- For EV charging stations in buildings provide at least 60 minutes fire resistance between the charging area (enclosure) and any other part of a premises
- Separate basement level parking garages with EV chargers, from other parts of the premises, by construction that provides ≥120 minutes fire resistance
- Give careful consideration to active fire control measures and ventilation arrangements for enclosed EV charging areas
- Provide automatic fire detection
- Avoid using extension leads with portable (granny) chargers
- Only charge EVs with OEM factory fitted batteries, or OEM approved compatible replacements fitted by a competent person

Sprinklers

Australian researchers *Thomas and Bennett* reported the findings of nine tests, involving twenty cars, looking at fire development in closed car parks

Conclusions:

- A sprinkler system was effective at controlling a developing fire
- A sprinkler system was equally as effective at controlling a fully developed fire
- Without sprinklers, fire is likely to spread from car to car
- With sprinklers, spread of fire is unlikely

Evidence derived from global research and research conducted by the BRE in a 2010 report *Fire spread in car parks* considered the effectiveness of sprinklers controlling fires in car parks and said*:*

'the incidence of fatalities and injuries is zero and the property loss is around 95% lower than that of an uncontrolled fire' *Ref: SCOSS ALERT Feb 2018*

The National Fire Chiefs Council's (NFCC) strongly recommends that enclosed car parks be fitted with sprinklers, as is common in Europe and recommended by NFPA (National Fire Protection Association) in the USA

Sprinklers

Sprinklers provide the best form of active fire protection for enclosed car parks

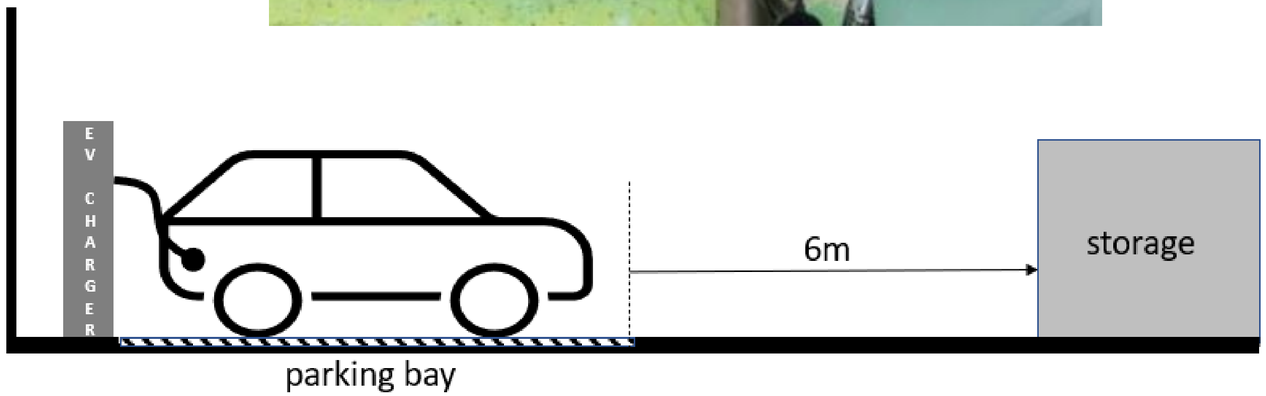
Install sprinklers in accordance with appropriate specifications for enclosed car parking areas to the LPC Sprinkler Rules (or equivalent property sprinkler rules, e.g. NFPA)

Note that as with other fire hazards, sprinklers are designed to control the spread of the fire but will probably not extinguish the fire itself

Burning EV car batteries are shielded undeath the body of the car and water will not be able to penetrate battery casings

Final fire control and extinguishment relies on the Fire & Rescue Service

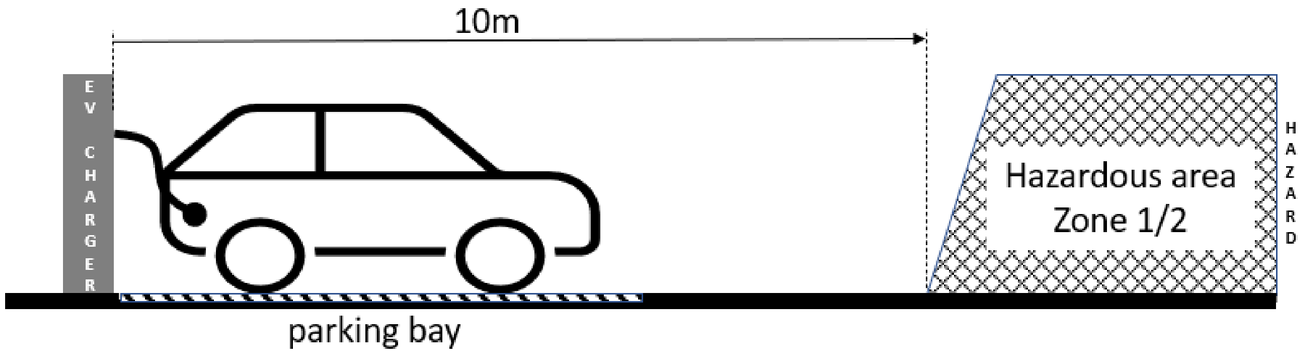
EV charger layout

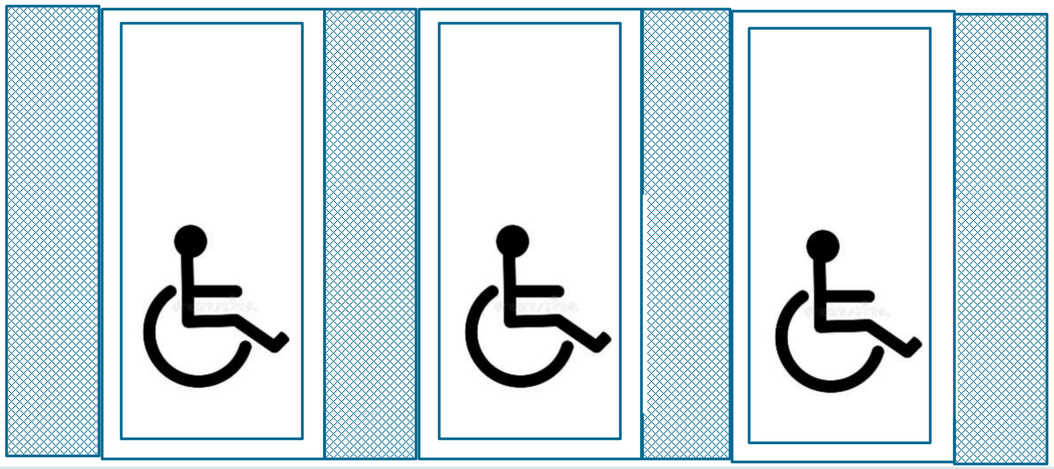


When selecting sites for charging points, sufficient space must be allowed for vehicles to be parked safely in the designated charging area, and for connection to be made to the charging equipment

Enclosed charging areas must be free from storage, including waste materials, with a separation of at least 6 metres

EV charger layout





Where hazardous installations, such as ignitable liquids storage, is present, EV charging points should be separated from the edge of hazardous areas (Zone 1 or 2, ATEX) by a minimum of 10 metres

Marked vehicle parking should include sufficient space to gain access to the vehicle, with a minimum 1,200mm wide transition zone between parking bays to account for disabled users and provide a minimum vehicle to vehicle lateral separation

NFCC – National fire chiefs council

E-bikes and e-scooters fire safety guidance

- Charging
- Storage
- Buying
- Damage and disposal

File pic: London Fire Brigade

The NFCC also publish Mobility Scooter (fire safety) Guidance for Residential Buildings

Approved Document S

The Building Regulations 2010

the charging of electric vehicles

S

Approved document sectio

Section 0: Introduction

Section 1: New residential b

Section 2: Material change for residential buildings

Section 3: New buildings c mixed-use buildings

Section 4: Major renovatic residential or mixed-use b

Section 5: Mixed-use build

Section 6: Standards for el and cable routes

Appendix A: Key terms

Appendix B: Standards refe

Appendix C: Documents re

Requirement

The erection of new residential buildings

S1. (1) A new residential building with associated parking must have access to electric vehicle charge points as

Requirement

Buildings undergoing major renovation which are not residential buildings or mixed-use buildings

S5. Where a building undergoing major renovation, which is not a residential building or a mixed-use building, will

6.1 This section sets out standards that electric vehicle charge points and cable routes should meet when installed to meet the requirements set out in this Approved Document.

NOTE: This Approved Document does not provide guidance on electrical or fire safety. Electrical and fire safety requirements are likely to apply when carrying out electrical work. Relevant regulations and guidance include the following.

(b) there are more associated parking spaces than there are dwellings contained in the residential building.

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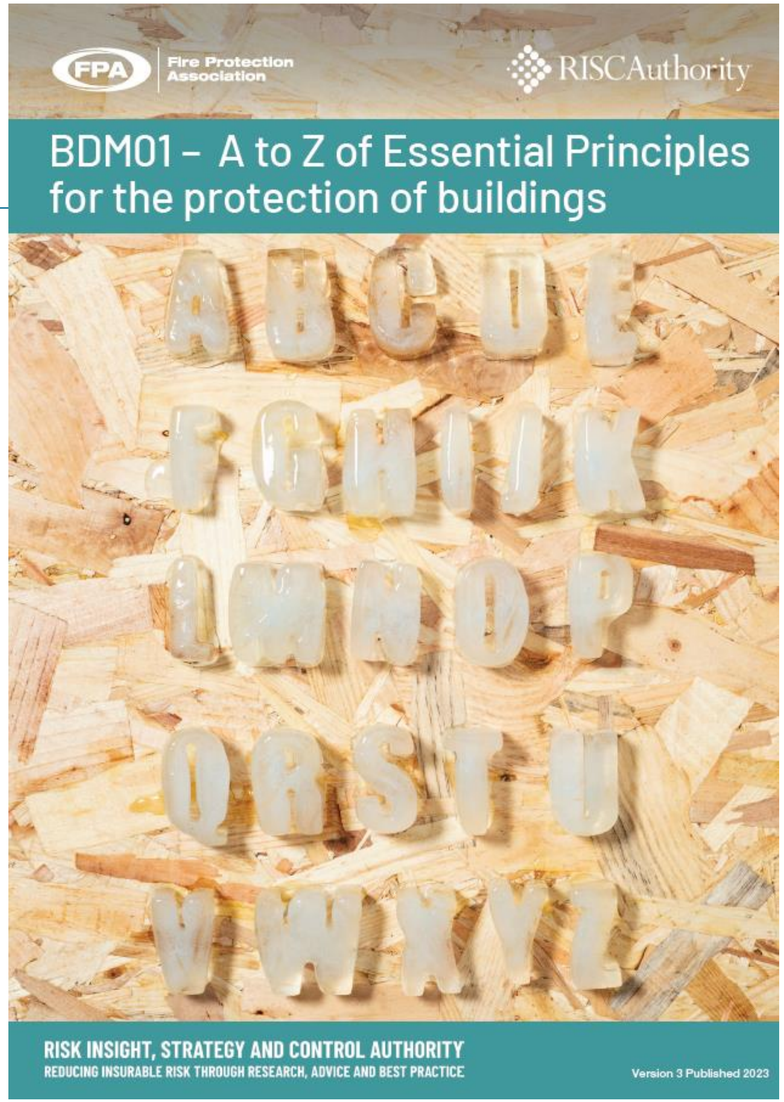
Struggling with Complexity

The A to Z of Essential Principles for the protection of buildings

Ian Abley - RISCAuthority

BDM01 Version 3 - 2023

RISCAuthority BDM01 A to Z of Essential Principles for the protection of buildings is an orderly recommendation to investors, on behalf of insurers, not to design and build solely down to the “life safety before collapse” objective on the assumption that the project is a “common building situation”. Instead, to define and insist upon the resilience their investment requires, beyond statutory guidance or Building Regulations. It calls for resilient construction innovation to improve health and life safety with measures anticipating likely events involving fire and water.



https://www.thefpa.co.uk/resource-download/234

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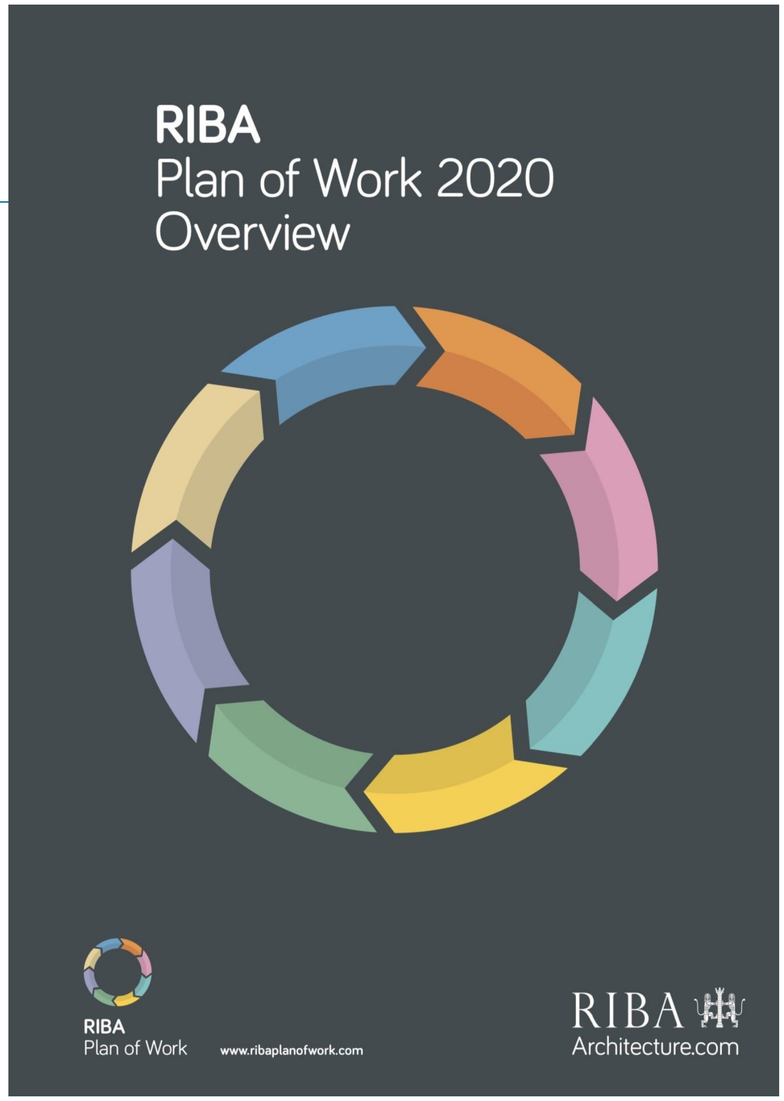

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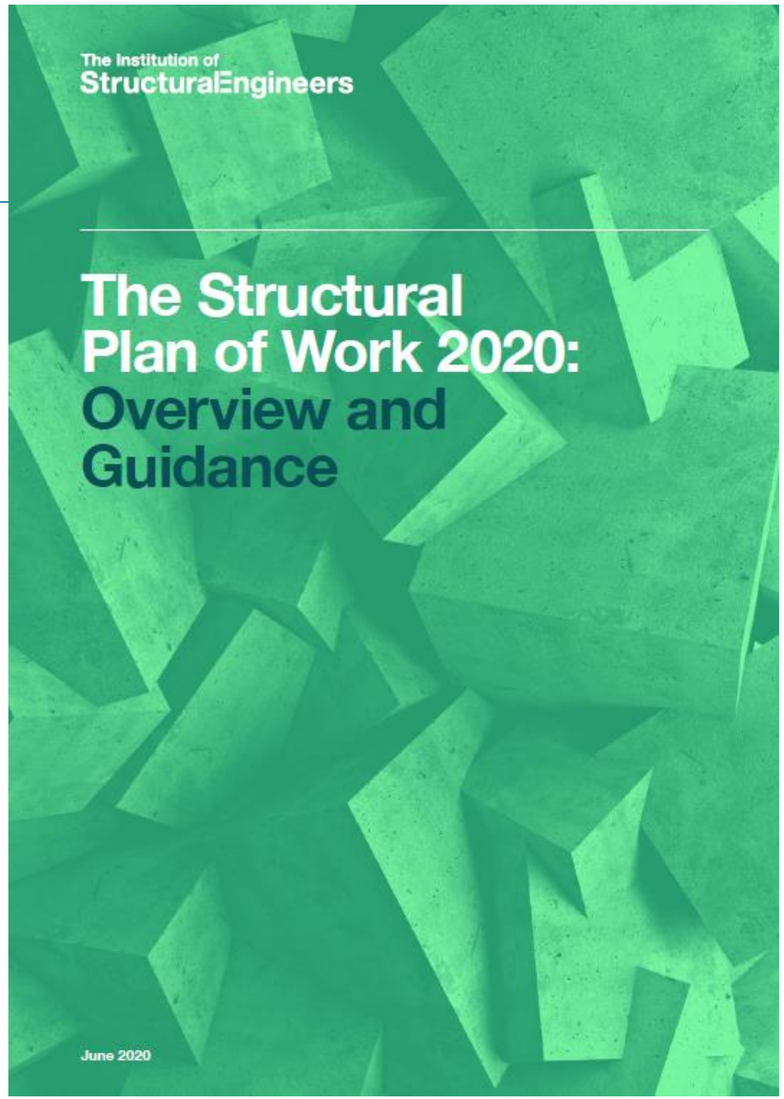

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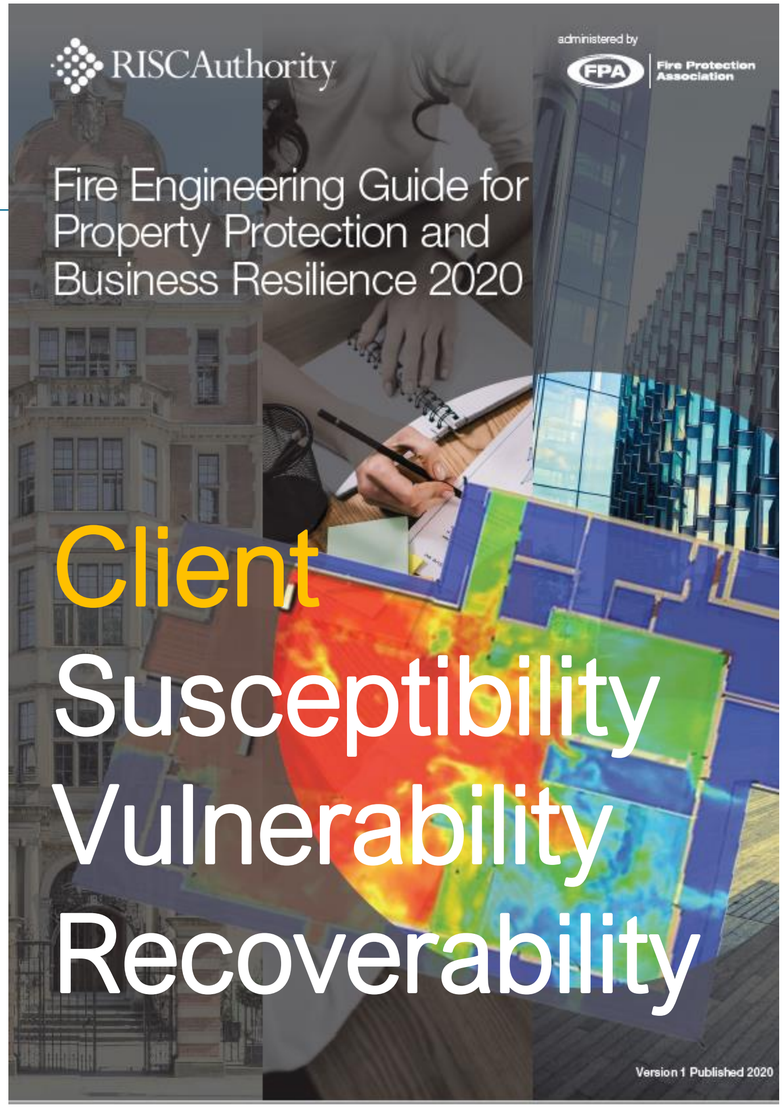

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Strategically Assess Resilience

Assess susceptibility, vulnerability, and recoverability in the structure, construction, and services systems against risks in fire, escape of water, and flooding, to define a strategy for the development project, to be critically reviewed over time.

A

RIBA Plan of Work 2020	Principles	Description	Phase
Work Stage 0 Strategic Definition	A	Strategically Assess Resilience	Undertake Early Consultation
	B	Engage Insurers Early	
Work Stage 1 Preparation and Briefing	C	Support Firefighting Operations	Prevent Fire Starting
	D	Maximise Non-Combustibility	
Work Stage 2 Concept Design	E	Anticipate Arson Attempts	
	F	Monitor Building Services	
	G	Address Occupational Issues	Lower Property Loss
Work Stage 3 Spatial Coordination	H	Extend Structural Stability	
	I	Reduce Fire Severity	
	J	Control Compartment Cavities	
Work Stage 4 Technical Design	K	Separate External Openings	
	L	Resist Fire Ingress	
	M	Expect Adverse Weather	
	N	Minimise Consequential Damage	
	O	Facilitate Simple Repair	Enhance Design Robustness
	P	Plan Salvage Operations	
	Q	Follow Identified Standards	
Work Stage 5 Manufacturing and Construction	R	Provide Reliable Detection	
	S	Complete Performance Tests	Check Construction Achieved
	T	Procure Quality Materials	
Work Stage 6 Handover	U	Require Competent Work	
	V	Verify Recorded Information	Improve Facilities Management
Work Stage 7 Use	W	Manage Fire Safety	
	X	Action Statutory Assessments	
	Y	Keep Maintenance Commitments	
	Z	Critically Review Experience	

https://www.thefpa.co.uk/resource-download/392

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Engage Insurers Early

Engage with professional indemnity, construction, defects, building, and contents insurers from the earliest Work Stage in project planning, to interrogate the value of the Essential Principles and optimise the insurability of the building in use.

B

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Support Firefighting Operations

Consult with the Fire and Rescue Service to facilitate operations in pursuit of life safety with an emphasis on timely self-evacuation, understanding that rescue is a statutory obligation, but protection of the asset requires additional measures.

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C Space Allocation

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	[illegible]	[illegible] Assessments	
	[illegible]	Keep [illegible] tenance Commitments	
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Monitor Building Services

Ensure all building services, including local sources of renewable energy or mains utilities connections, are designed, installed, commissioned, and maintained to prevent them being a cause of fire ignition, smoke spread, or water damage.

F

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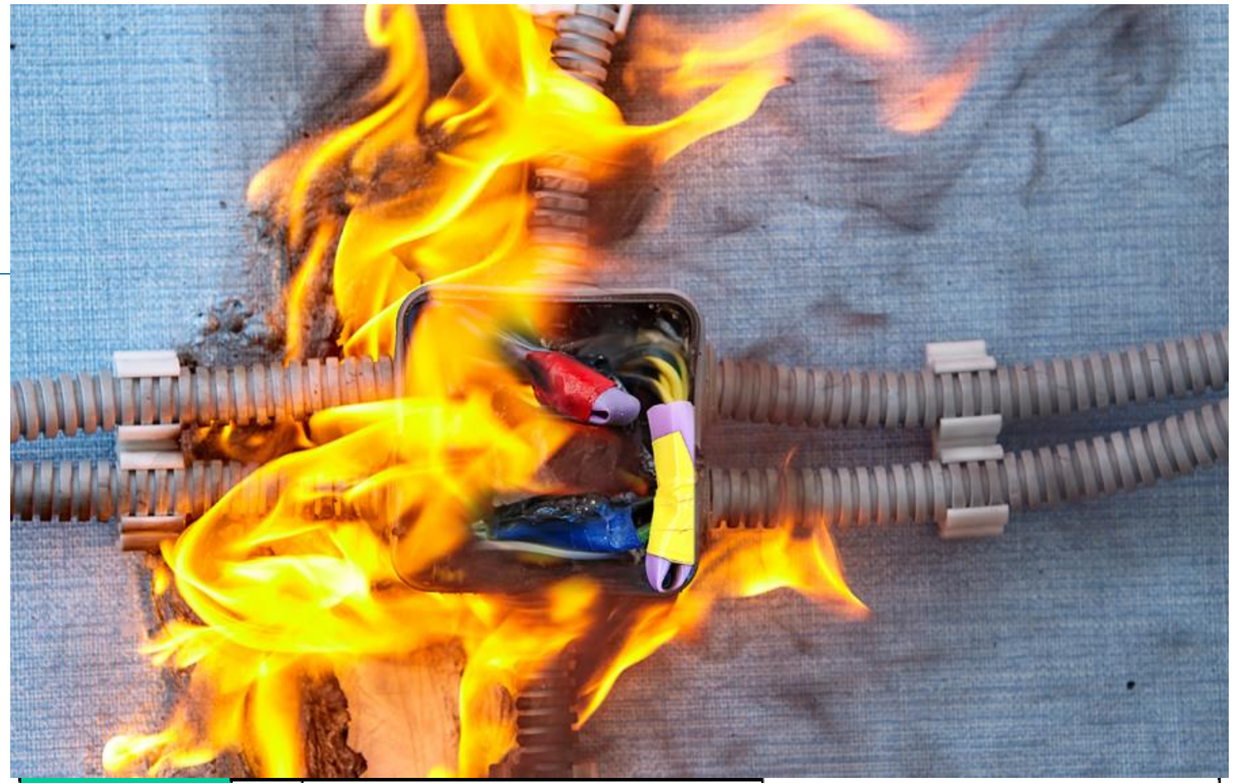

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BASEC
BRITISH APPROVALS SERVICE FOR CABLES

CIBSE

THE SOCIETY OF PUBLIC HEALTH ENGINEERS

Monitor Building Services

Ensure all building services, including local sources of renewable energy or mains utilities connections, are designed, installed, commissioned, and maintained to prevent them being a cause of fire ignition, smoke spread, or water damage.

F

BIM

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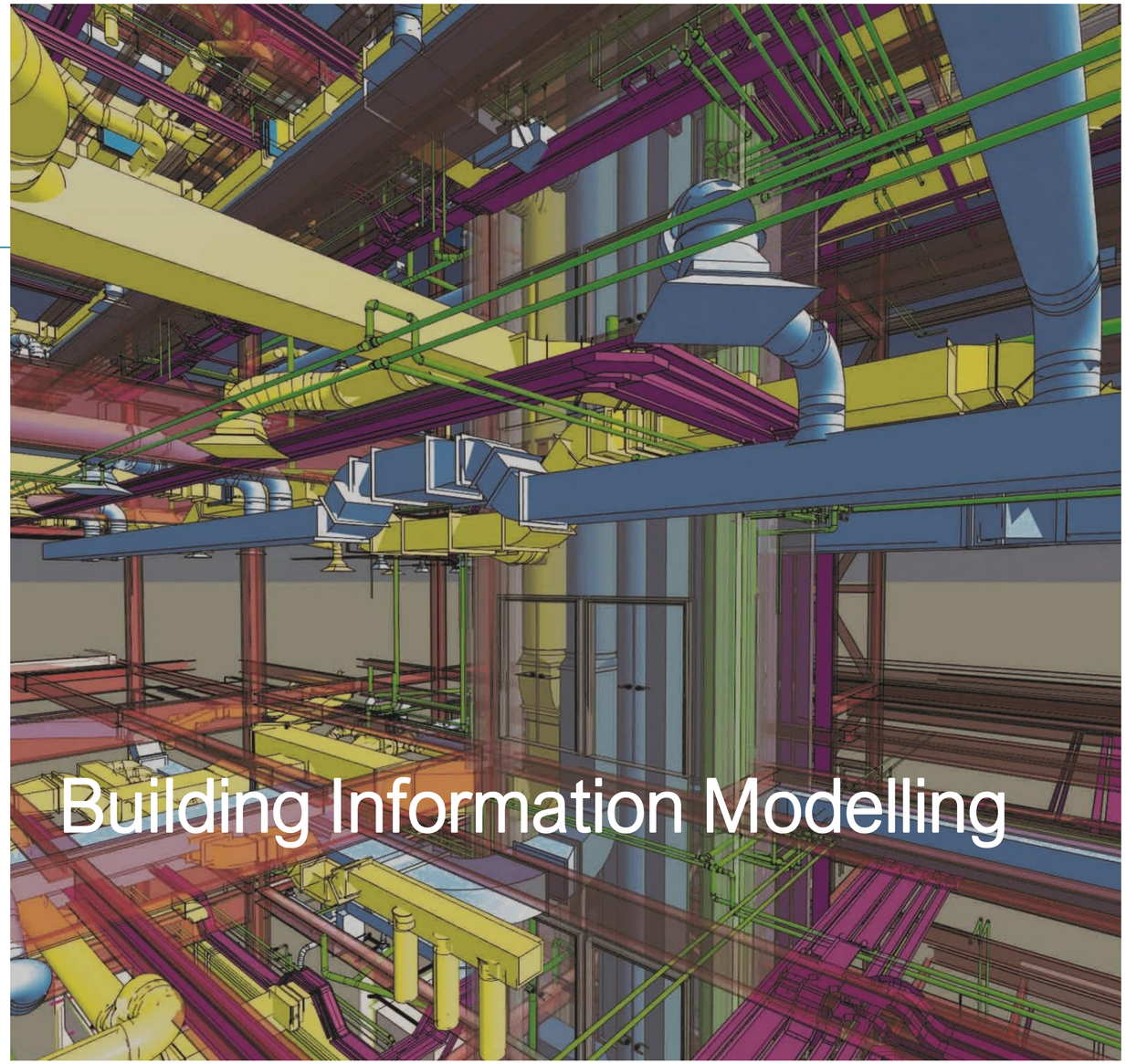

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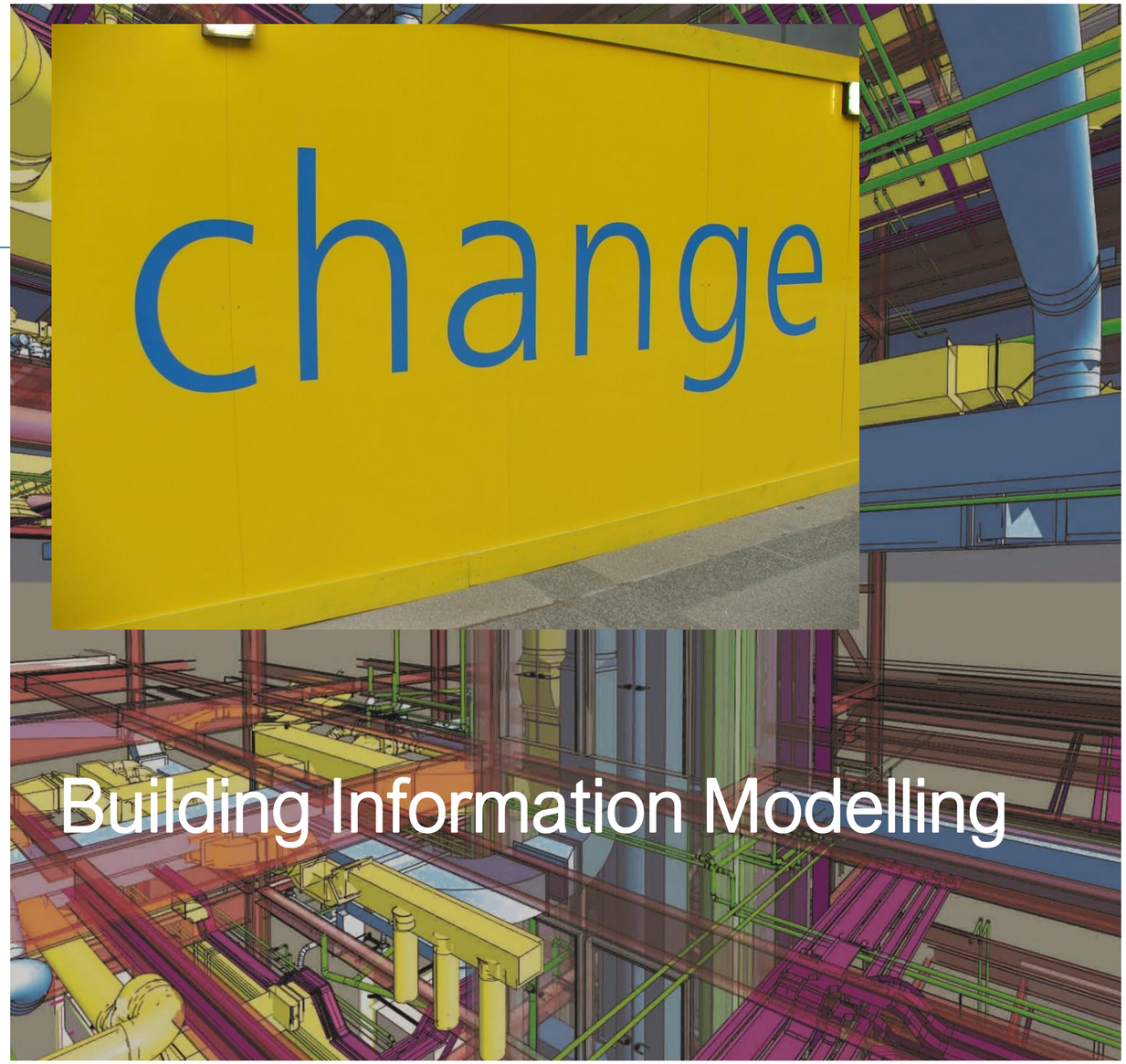

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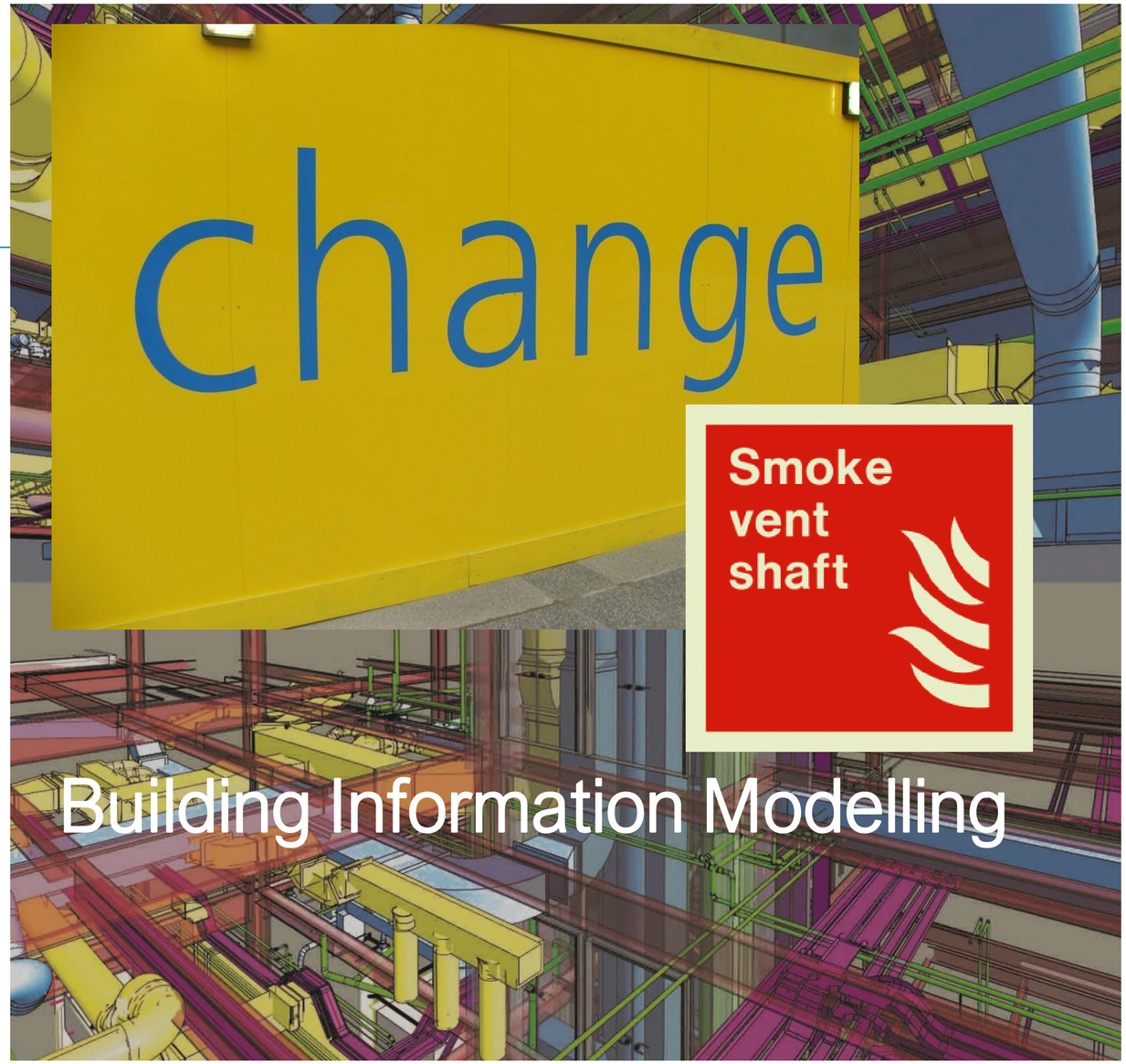

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F

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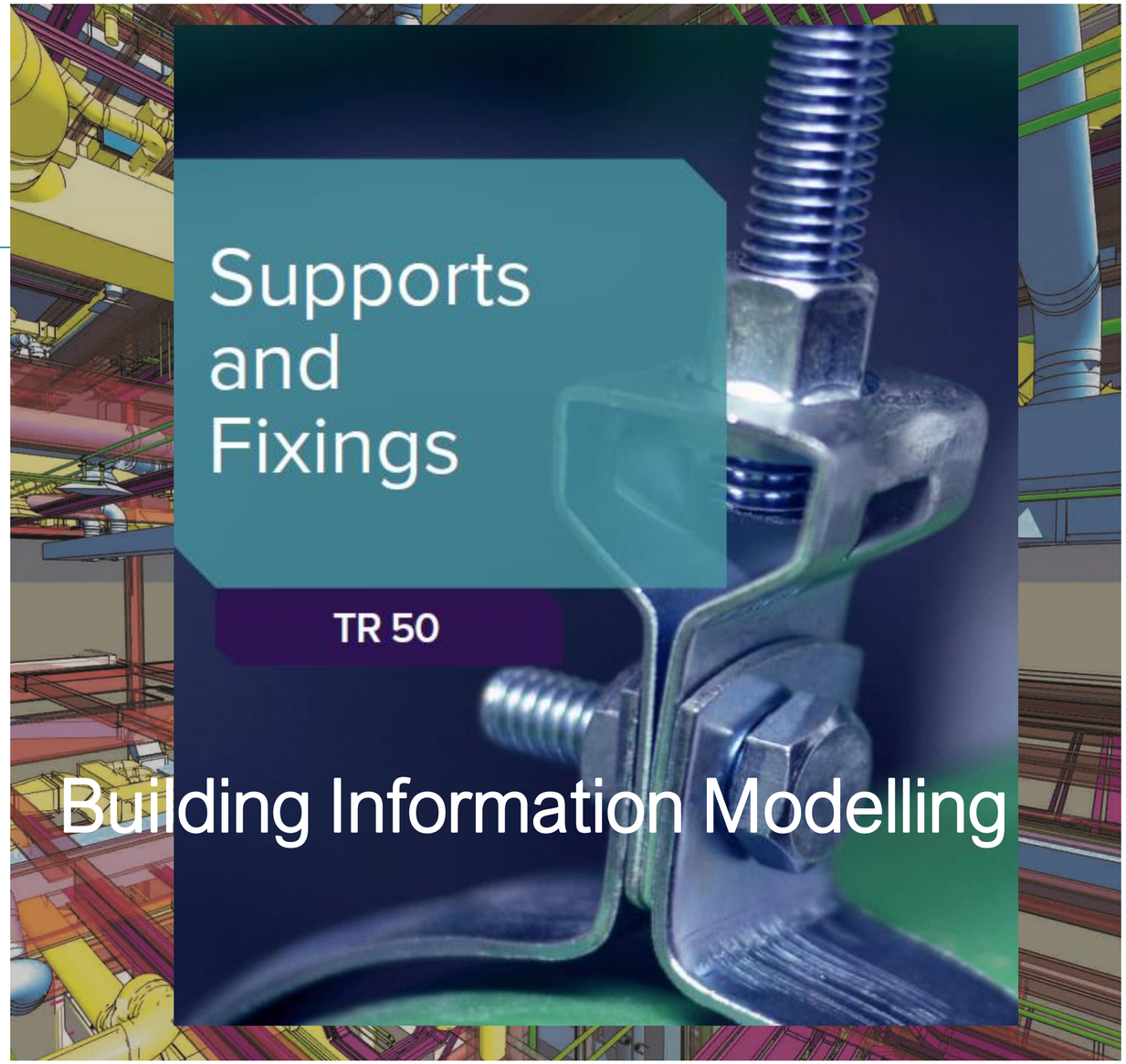
BESA
BUILDING ENGINEERING SERVICES ASSOCIATION



CIBSE

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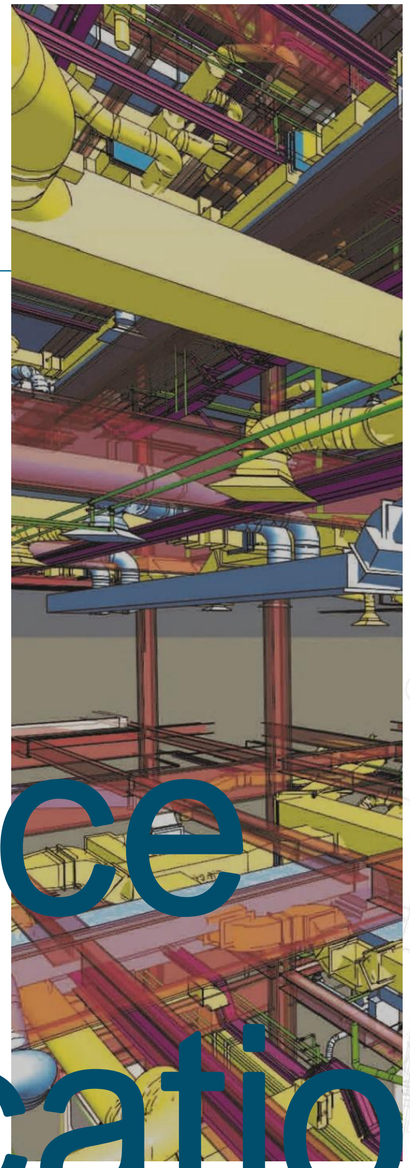
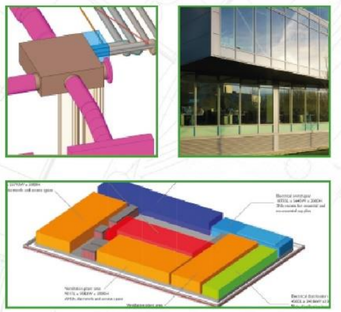


BSRIA

BG 6/2018

A Design Framework for Building Services 5th edition

By David Churcher, Martin Ronceray and John Sands



F Space Allocation

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THE SOCIETY OF PUBLIC HEALTH ENGINEERS

Monitor Building Services

Ensure all building services, including local sources of renewable energy or mains utilities connections, are designed, installed, commissioned, and maintained to prevent them being a cause of fire ignition, smoke spread, or water damage.

F Space Allocation

RIBA Plan of Work 2020	Principles	Description	Phase
Work Stage 0 Strategic Definition	A	Strategically Assess Resilience	Undertake Early Consultation
	B	Engage Insurers Early	
Work Stage 1 Preparation and Briefing	C	Support Firefighting Operations	Prevent Fire Starting
	D	Maximise Non-Combustibility	
Work Stage 2 Concept Design	E	Anticipate Arson Attempts	
	F	Monitor Building Services	
	G	Address Occupational Issues	Lower Property Loss
Work Stage 3 Spatial Coordination	H	Extend Structural Stability	
	I	Reduce Fire Severity	
	J	Control Compartment Cavities	
	K	Separate External Openings	
Work Stage 4 Technical Design	L	Resist Fire Ingress	
	M	Expect Adverse Weather	
	N	Minimise Consequential Damage	
	O	Facilitate Simple Repair	Enhance Design Robustness
	P	Plan Salvage Operations	
	Q	Follow Identified Standards	
Work Stage 5 [illegible] and Construction	R	Provide Reliable Detection	
	S	Complete Performance Tests	Check Construction Achieved
	T	Procure Quality Materials	
Work Stage 6 Handover	U	Require Competent Work	
	V	Verify Recorded Information	Improve Facilities Management
Work Stage [illegible] Use	[illegible]	Manage Fire Safety	
	[illegible]	[illegible] Assessments	
	[illegible]	Keep [illegible] tenance Commitments	
	[illegible]	Critically Review Experience	

Monitor Building Services

Ensure all building services, including local sources of renewable energy or mains utilities connections, are designed, installed, commissioned, and maintained to prevent them being a cause of fire ignition, smoke spread, or water damage.

Principle F – Monitor Building Services **BDM01-9.6**

Ensure all building services, including local sources of renewable energy or mains utilities connections, are designed, installed, commissioned, and maintained to prevent them being a cause of fire ignition, smoke spread, or water damage.

F.1	Building services are specified and procured to support Principles D, I and J
F.2	Smoke ventilation shafts tested to achieve a Smoke Leakage (S) rate
F.3	Drainage systems and water mains in separate waterproof service risers
F.4	External services or drainage through service risers to prevent climbing
F.5	Building services are maintained in working order as Principle Y
F.6	Combustion appliances and fuel storage comply with Building Regulations
F.7	Gas services avoiding protected escape routes in ventilated service risers
F.8	Gas main isolation valves agreed with the Fire and Rescue Service
F.9	Hydrogen technologies require specialist guidance in the Resilience Strategy
F.10	Electrical services and meters in risers are separate from gas services
F.11	Electrical installations comply with the Building Regulations
F.12	Electricity generation requires specialist guidance in the Resilience Strategy
F.13	Electrical main isolation switches agreed with the Fire and Rescue Service
F.14	Emergency lighting, illuminated fire signage, and Fire Control Panels
F.15	Hot water services require specialist guidance in the Resilience Strategy
F.16	Fire door hold-open or free-swing devices operate on first smoke detection
F.17	Smoke systems, fire curtains, fire shutters, and closing devices maintained
F.18	Protection against lightning strike as Principle M.8 protects building services
F.19	Building services are verified through recorded information as Principle V
F.20	Movable heating and ventilation appliances are unnecessary or managed

F Space Allocation

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Reduce Fire Severity

Compartmentalise and fully protect the building with a sprinkler system so that if a fire starts, the extent of fire, heat, and smoke damage should be minimised and confined in the compartment of origin, so far as reasonably practicable.

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	H	Extend Structural Stability	
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Work Stage 4 Technical Design	L	Resist Fire Ingress	
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	N	Minimise Consequential Damage	
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	P	Plan Salvage Operations	
	Q	Follow Identified Standards	
Work Stage 5 Manufacturing and Construction	R	Provide Reliable Detection	
	S	Complete Performance Tests	Check Construction Achieved
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	V	Verify Recorded Information	Improve Facilities Management
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	X	Action Statutory Assessments	
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Reduce Fire Severity

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Work Stage 5 Manufacturing and Construction	R	Provide Reliable Detection	
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	V	Verify Recorded Information	Improve Facilities Management
Work Stage 7 Use	W	Manage Fire Safety	
	X	Action Statutory Assessments	
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	Z	Critically Review Experience	

https://www.thefpa.co.uk/resource-download/405

Reduce Fire Severity

Compartmentalise and fully protect the building with a sprinkler system so that if a fire starts, the extent of fire, heat, and smoke damage should be minimised and confined in the compartment of origin, so far as reasonably practicable.

onstruction Achieved

e Facilities Management

https://www.thefpa.co.uk/resource-download/405

Procure Quality Materials

Insist upon the procurement of materials, products, and systems with third party certification schemes accredited by the United Kingdom Accreditation Service, with proof of service life in application and full disclosure of fire safety information.

RIBA Plan of Work 2020	Principles	Description	Phase
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Require Competent Work

Confirm protection measures are installed by identified specialists, trained and supervised under third party quality of work schemes accredited by the United Kingdom Accreditation Service, with full disclosure of fire safety information.

U

RIBA Plan of Work 2020	Principles	Description	Phase
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Verify Recorded Information

Accept only pertinent and accurate information at handover, insisting contractors satisfy statutory and contractual duties, checking record information provides full disclosure of the premises as built and commissioned for facilities management.

V

RIBA Plan of Work 2020	Principles	Description	Phase
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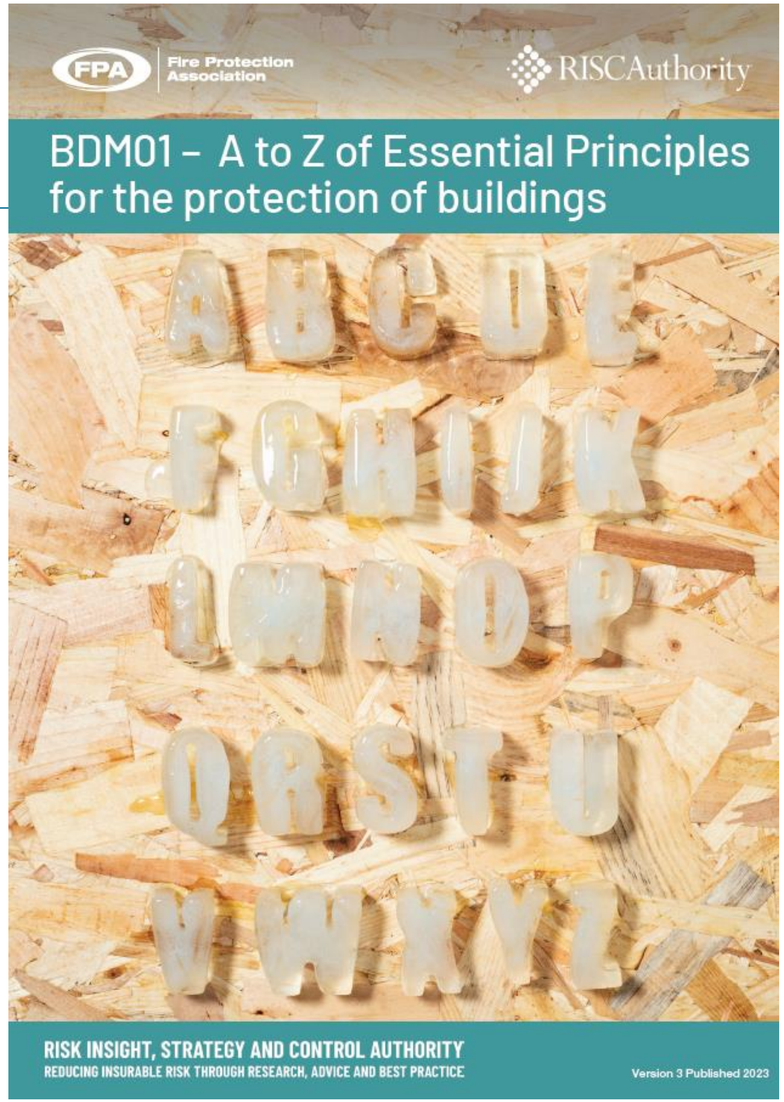
BDM01 Version 3 - 2023

RISCAuthority BDM01 A to Z of Essential Principles for the protection of buildings is an orderly recommendation to investors, on behalf of insurers, not to design and build solely down to the “life safety before collapse” objective on the assumption that the project is a “common building situation”. Instead, to define and insist upon the resilience their investment requires, beyond statutory guidance or Building Regulations. It calls for resilient construction innovation to improve health and life safety with measures anticipating likely events involving fire and water.



https://www.thefpa.co.uk/resource-download/234

Insurer A to Z of Essential Principles

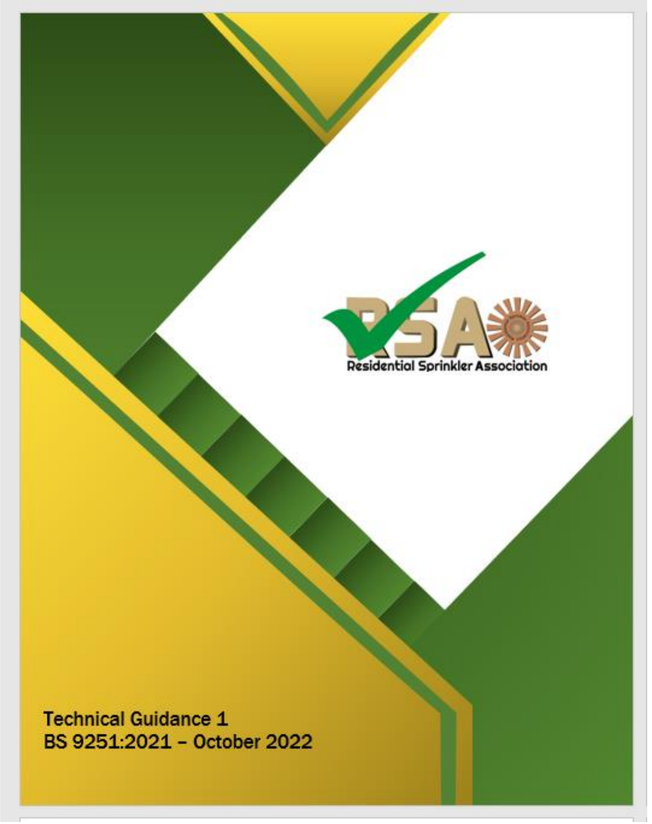
Ian Abley - RISCAuthority
iabley@thefpa.co.uk

RESIDENTIAL SPRINKLER CHANGES: BS9251:2021

Andrew Milham - RSA

About – Residential Sprinkler Association

- Represent residential sprinkler companies throughout the UK.
- We provide installer and designer training and over the last 3 years we have trained over 830 installers allowing them to get their JIB Skills Cards.
- Provide guidance, technical advise and keep members up to date with industry changes.
- Standard representative who sits on the BSI committee and was involved in the writing of BS9251:2021.
- Recently released TG1 (Technical Guidance Document 1 – BS9251:2021) to clear up some of the ambiguity which is present within the standard.



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Residential Sprinkler Association

The Society of Public Health Engineers

Responsibility switch – BS9251:2021

- The type of occupancy of the property
- Intended use of the building
- The water supply requirements and availability
- Any additional system enhancements required
- Occupancy types for sprinkler protected areas
- How the sprinkler system alarms interact with fire alarm system
- Non-residential areas hazard review – See C13

Additional risk factors to be determined:

- Higher fire safety risk – assessment to determine if there are any additional risks that are not normally found in residential accommodation
- Compensatory Feature – where the sprinkler system is provided for departures from other standards or national guidance
- Occupancy Profile – vulnerable people etc

If any of the additional risk factors have been identified, enhanced measures should be considered such as increasing the category of system, and/or design density and/or resilience of system.

Once the sprinkler designer has been given a specification, they should determine if the specification seems appropriate for the building and then proceed to design the system following on from clause 4.3.

- New category 4 system for buildings above 18M.

Increased duration – 60 Minutes

Enhanced water supplies:

- Dual Pumps
- Split Tank
- Back up power supplies – Generator / UPS / Secondary grid supply.

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The Society of Public Health Engineers

Additional protection – BS9251:2021

- BS9251 has always stated that the building should be sprinkler protected throughout however Approved Document B only calls for sprinklers within apartments. With the release of the latest code of practice it has become more common for sprinklers to be located within corridors and a limited number of non residential areas. BS9251 provides guidance on how these areas could be protected if the residential system is extended however this is subject to a hazard review from a fire consultant.

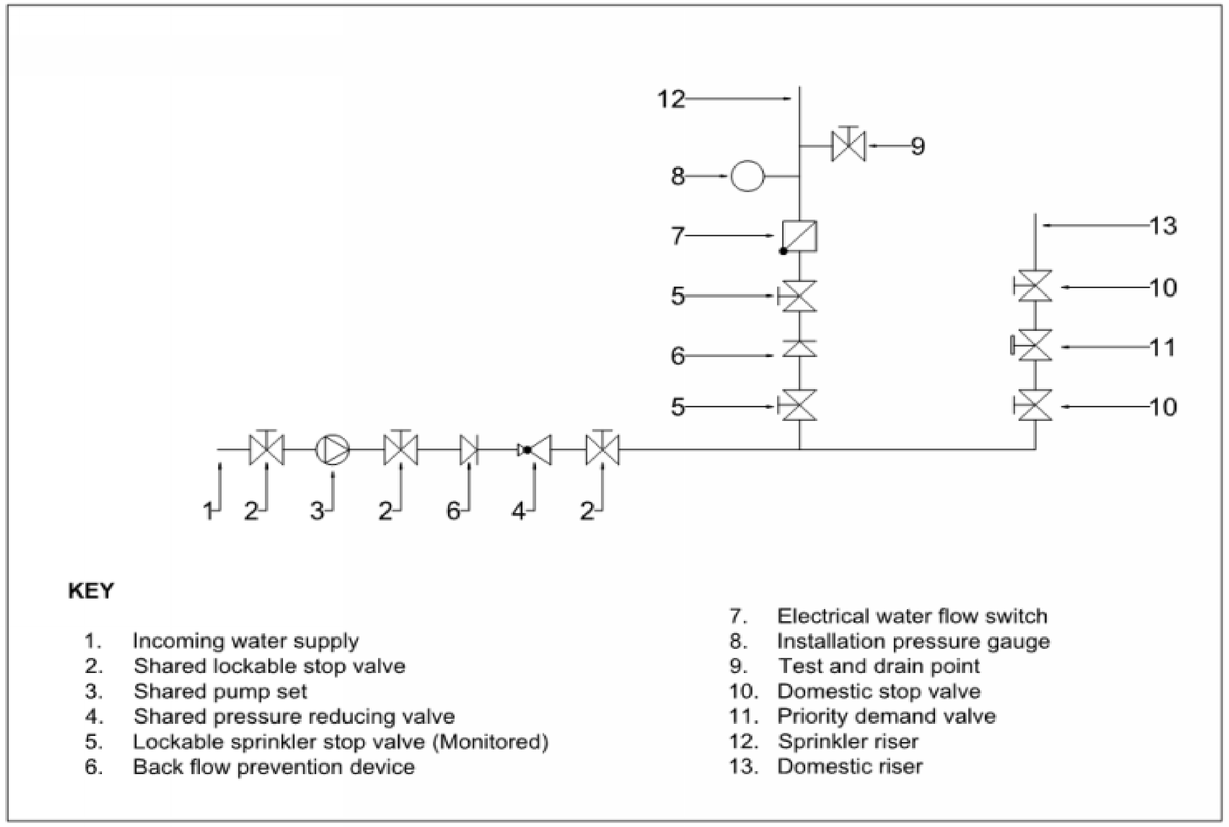
- Where plastic pipework is distributed through exposed areas, the compartment should be sprinkler protected. (Alternatively use steel).

- Cupboards with electrical equipment or more than 1 light now require sprinkler protection regardless of size.

- Bathrooms less than 5sqms may still require protection if the linings do not confirm to the classes listed in BS9251.

Monitored isolation valves (excluding category 1)

Figure 9 –*Typical shared boosted cold-water arrangement - dedicated sprinkler riser:*

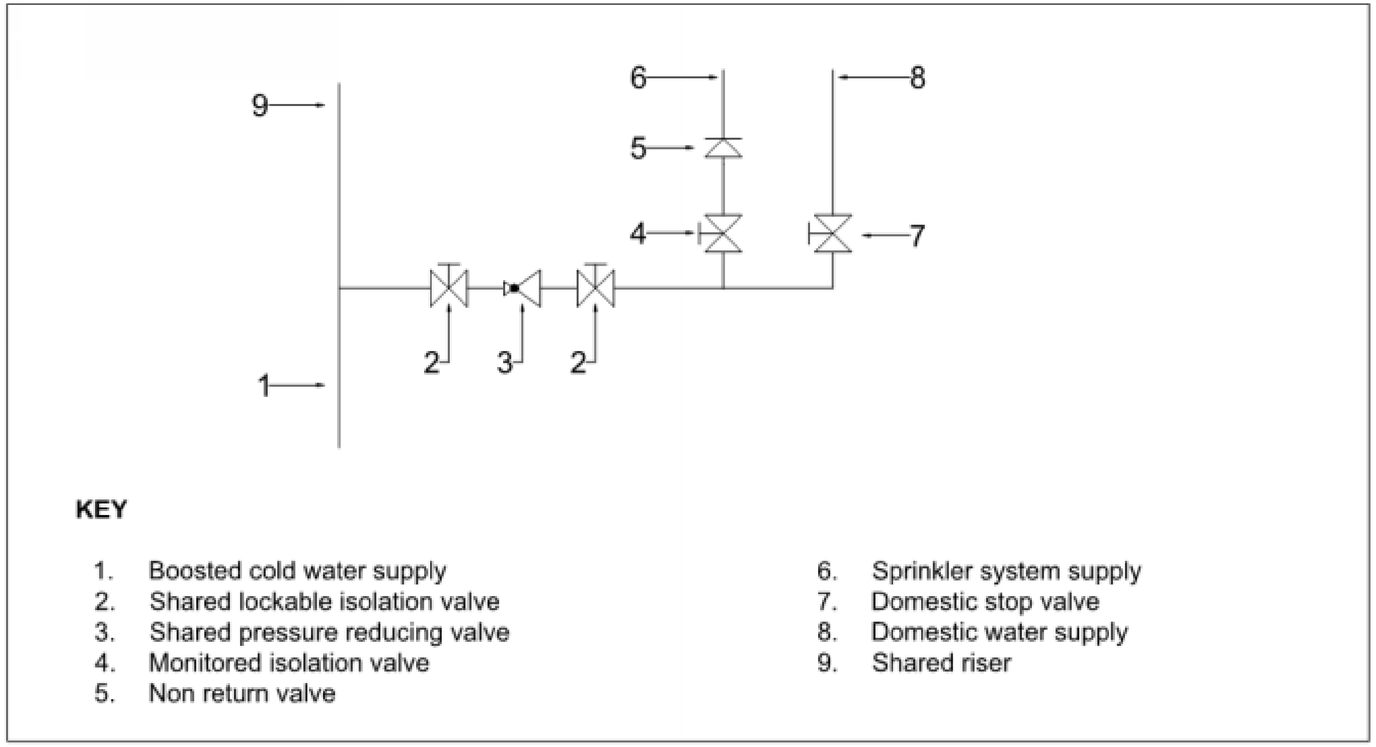


KEY

1. Incoming water supply
2. Shared lockable stop valve
3. Shared pump set
4. Shared pressure reducing valve
5. Lockable sprinkler stop valve (Monitored)
6. Back flow prevention device
7. Electrical water flow switch
8. Installation pressure gauge
9. Test and drain point
10. Domestic stop valve
11. Priority demand valve
12. Sprinkler riser
13. Domestic riser

Pressure Reducing Valves

Figure 8– *Typical shared boosted cold-water riser arrangement - branch per floor:*



KEY

1. Boosted cold water supply
2. Shared lockable isolation valve
3. Shared pressure reducing valve
4. Monitored isolation valve
5. Non return valve
6. Sprinkler system supply
7. Domestic stop valve
8. Domestic water supply
9. Shared riser

Share the boosted cold water tank and pump!

PROS:

Additional resilience built in
Constantly monitored and faults responded to quicker
Less space needed for pumps and tanks
Pressure reducing valves
Cost effective

CONS:

Bigger combined tank that might cause issues with turnover of water

Boosted cold water tank sizing

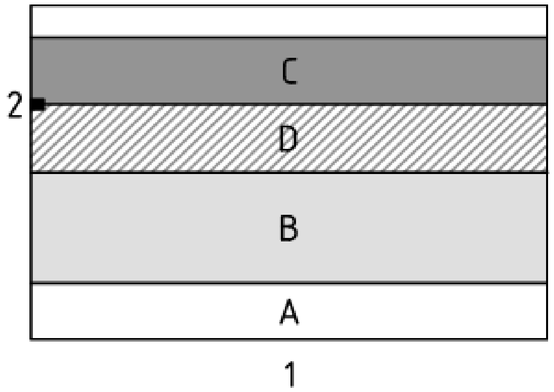
A – Unusable Water

B – Required Sprinkler Volume

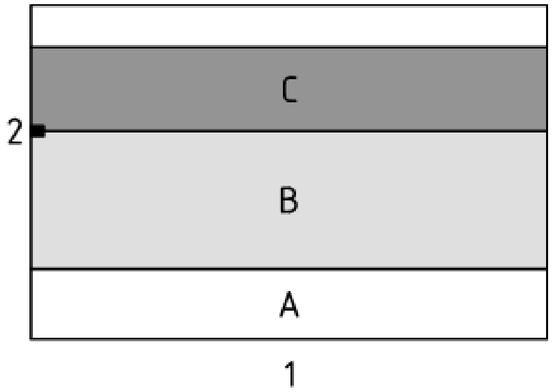
C – Buffer Volume

D – Building Peak Domestic – Over the sprinkler systems duration!

Please note the anticipated peak demand is not the same as Qmax and the peak instantaneous demand over the system run time.



a) Shared water supply with no PDV and a shared pump



b) Shared water supply with a PDV and a shared pump

Boosted cold water tank sizing - No PDV

A – Unusable Water

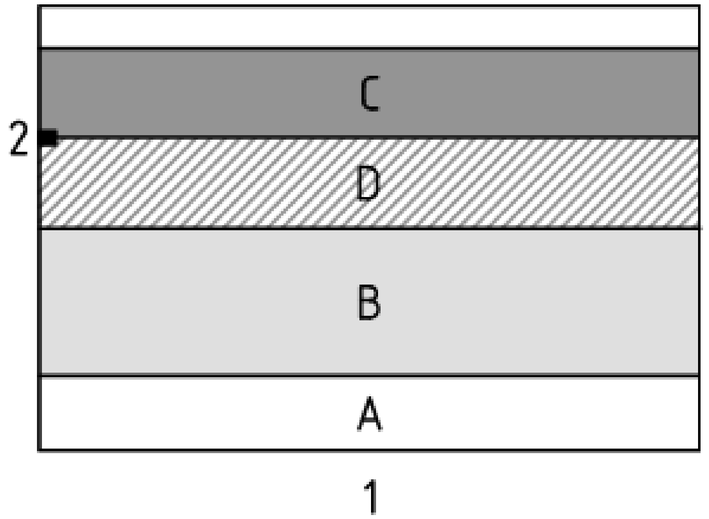
B – 12,000 (Category 4 system apartment only)

D – 18,000 Buildings Peak Domestic demand – Over the sprinkler systems duration!

Requirement = 30,000L below low level alarm.

Can be reduced down to 9000L with a proven rate of infill (70% reduction using 80% of a proven rate)

SHARED TANK WITHOUT A PDV.



Please note for this hypothetical scenario the tank would only be 6500L without sprinklers.

Boosted cold water tank sizing – With PDV

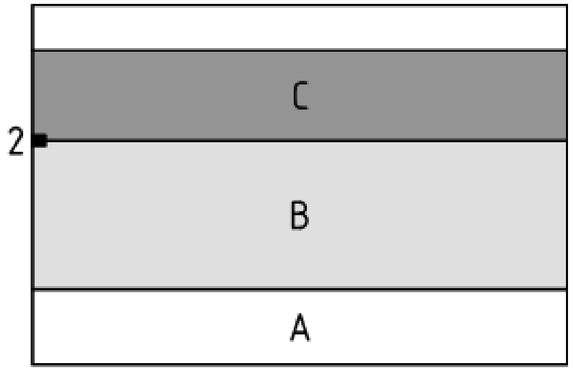
A – Unusable Water

B – 12,000 (Category 4 system apartment only)

Requirement = 12,000L below low level alarm.

Can be reduced down to 3600L with a proven rate of infill (70% reduction using 80% of a proven rate)

SHARED TANK WITH A PDV.



Please note for this hypothetical scenario the tank would only be 6500L without sprinklers.

Buffer Volume

Option 1 – Domestic sizing without sprinklers.

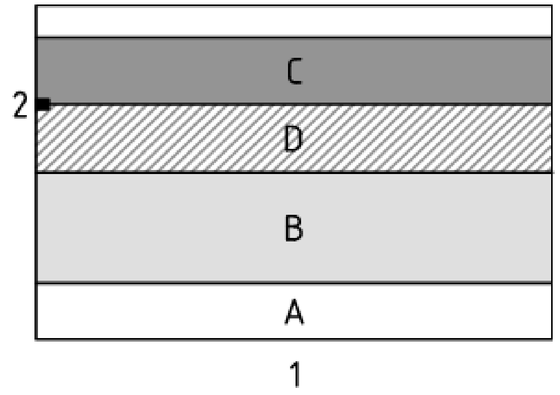
Option 2 – A reduced buffer volume based on output – input for 15/20minutes.

Working example:

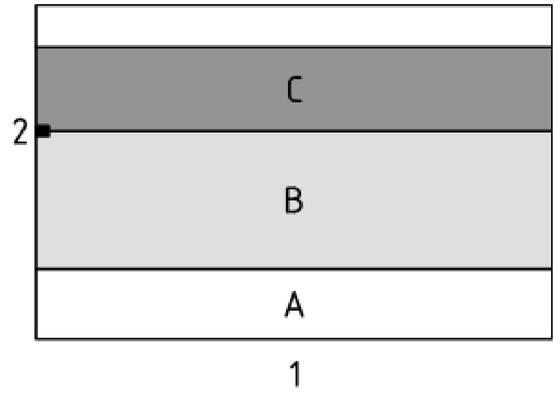
1. ***Domestic peak demand ("Qdemand" in l/min) = 150l/min***
2. ***Domestic peak duration ("Qduration" in minutes) = 20 minutes***
3. ***Lowest expected infill flow rate ("Qinfill" in l/min) = 100l/min***

(150l/min – 100l/min) x 20minutes = 1000L

NOTE: Height differential / delayed ball valve may need to be taken into consideration.



a) Shared water supply with no PDV and a shared pump



b) Shared water supply with a PDV and a shared pump

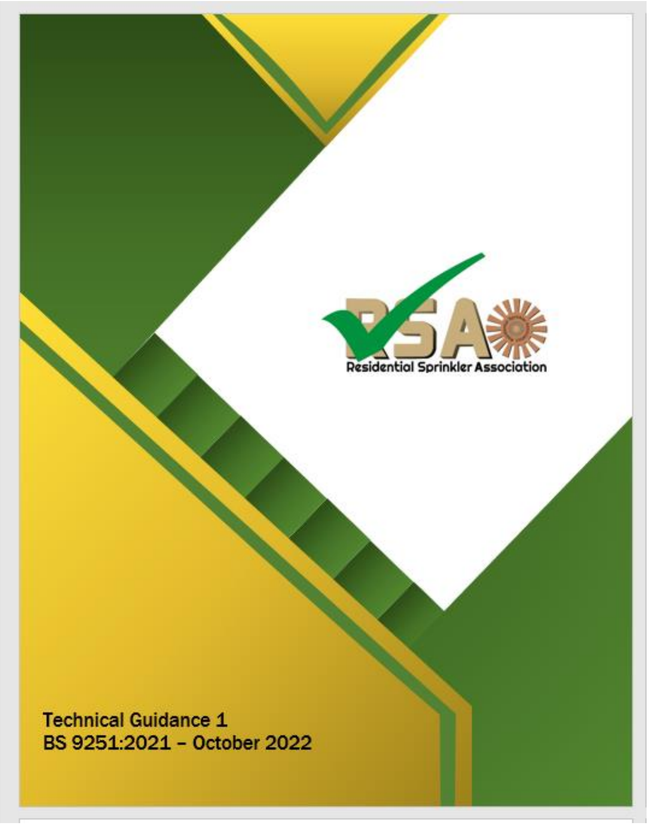
Priority demand valves

- N/C Valve
- Interfaced with low level alarm.
- Multiple Priority demand valves on one scheme need to interfaced correctly.

Andrew Milham – Head of technical committee

Residential Sprinkler Association

Thanks for listening.



Q & A

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