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FIRE DAMPER PROCESS WORKBOOK

V1 DEC 2023

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A UNIQUE NON-FOR-PROFIT INITIATIVE COMPRISING MAJOR CONTRACTORS, SPECIALIST INSTALLERS AND RELEVANT TRADE ASSOCIATIONS

A COLLABORATIVE FORUM TO DRIVE CULTURE CHANGE THROUGH THE DESIGN AND CONSTRUCTION PROCESS TO IMPROVE FIRE SAFETY IN BUILDINGS

OUR MISSION IS TO IMPROVE THE DELIVERY OF WELL DESIGNED, SPECIFIED AND INSTALLED PASSIVE FIRE PROTECTION BY FOCUSING ON 3 KEY AREAS:

PROCESS, TESTING AND EDUCATION.

LAING O'ROURKE

mace

Wates

ASFP

CANARY WHARF LONDON

Sir Robert McALPINE

Balfour Beatty

KIER

ISG

VINCI

WILLMOTT DIXON

MULTIPLEX

BESA BUILDING ENGINEERING SERVICES ASSOCIATION

bam

FIS

addc

GPDA Gypsum Products Development Association

OBJECTIVE – FIRE DAMPERS

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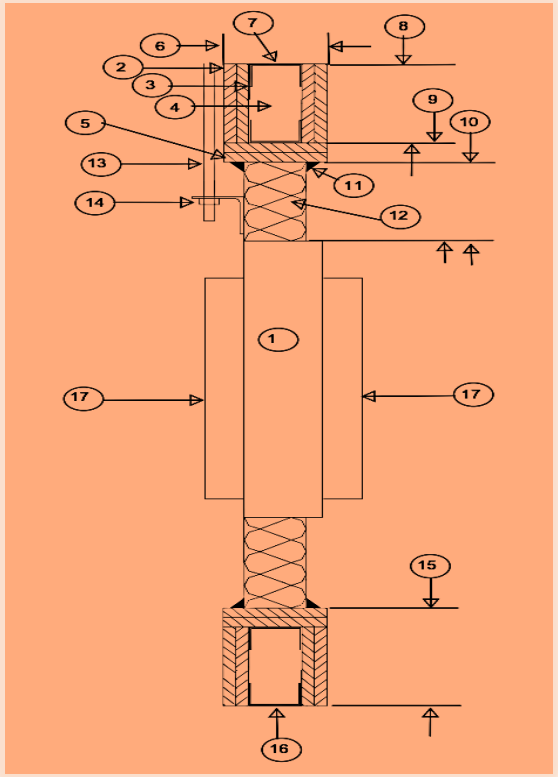
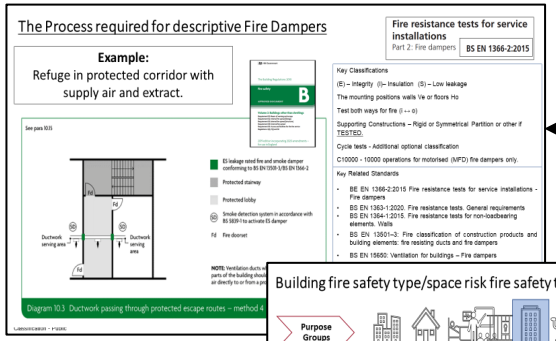
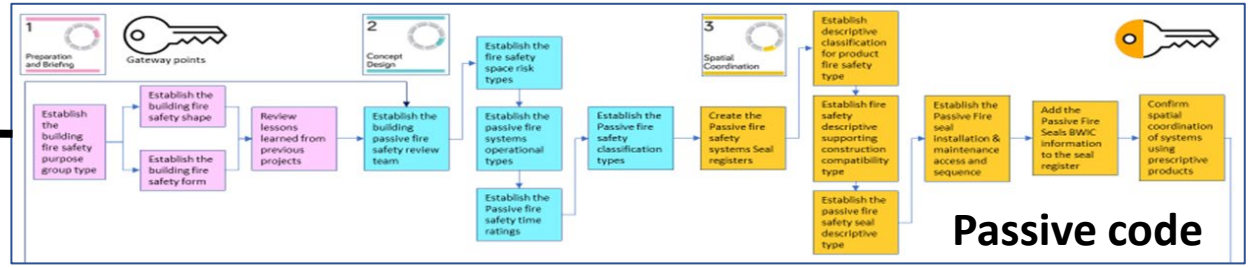
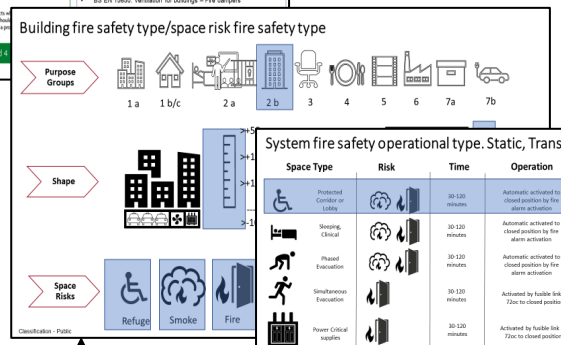
- The objective of this presentation is to illustrate a best practice approach to the design and specification of Fire Dampers and their associated services penetration seals where they pass through fire compartment walls or floors.
- The aim is to give the reader an understanding of the process required to ascertain the route to achieve an appropriate fire damper, compatibility of the fire wall or floor system and the access arrangements for installation, digital recording and future maintenance
- The output of the process will produce the classification of the fire damper for selection.

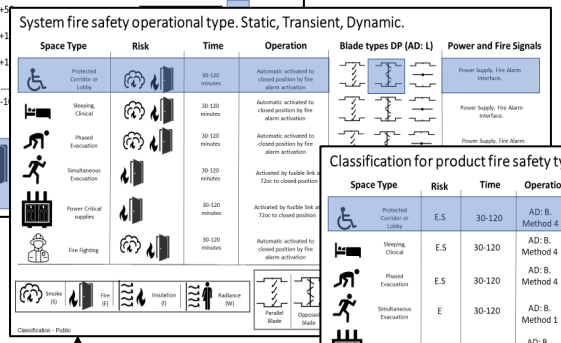


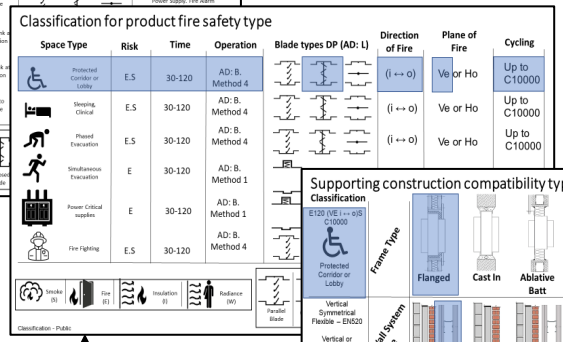
Fire Damper Work Book Example

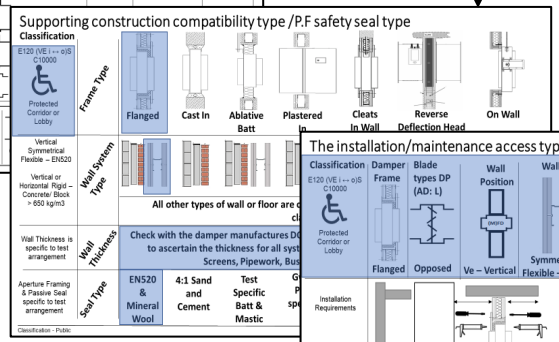


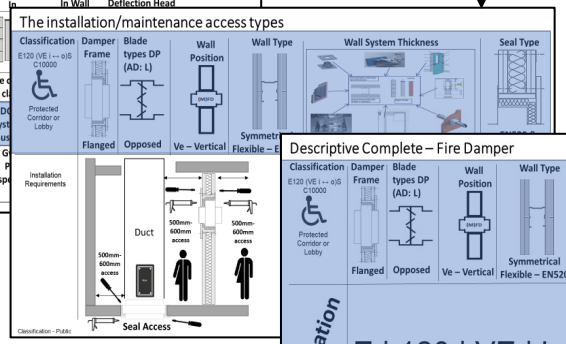


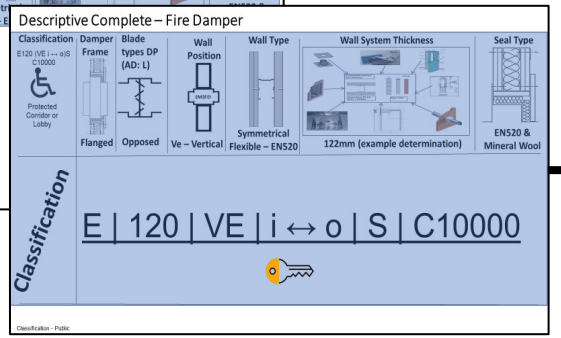


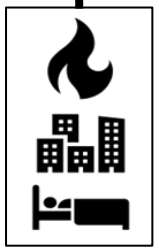


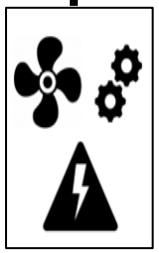


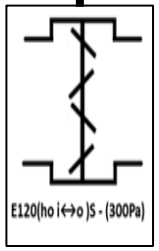


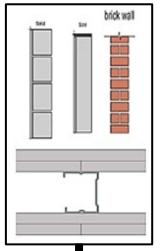


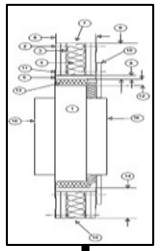












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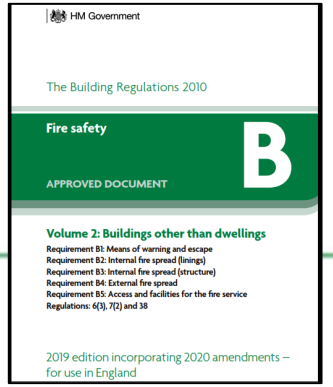
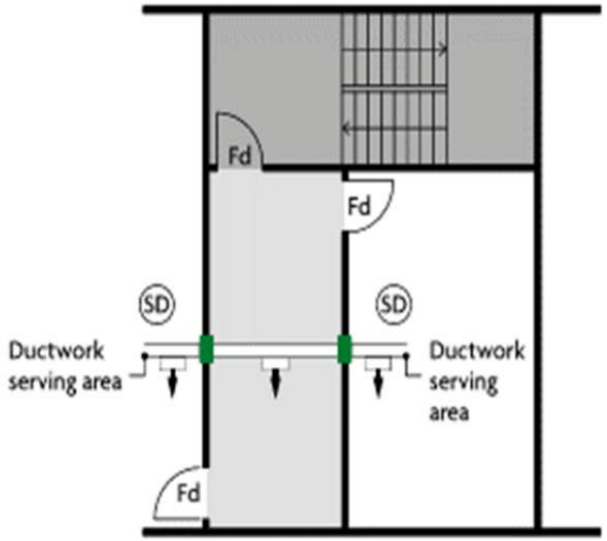
The Process required for descriptive Fire Dampers

Example:

Refuge in protected corridor with supply air and extract.



See para 10.15



ES leakage rated fire and smoke damper conforming to BS EN 13501-3/BS EN 1366-2

Protected stairway

Protected lobby

SD Smoke detection system in accordance with BS 5839-1 to activate ES damper

Fd Fire doorset

NOTE: Ventilation ducts which serve other parts of the building should not supply or extract air directly to or from a protected escape route.

Diagram 10.3 Ductwork passing through protected escape routes – method 4

Fire resistance tests for service installations

Part 2: Fire dampers

BS EN 1366-2:2015

Key Classifications

(E) – Integrity (I)– Insulation (S) – Low leakage

The mounting positions walls Ve or floors Ho

Test both ways for fire (i ↔ o)

Supporting Constructions – Rigid or Symmetrical Partition or other if TESTED.

Cycle tests - Additional optional classification

C10000 - 10000 operations for motorised (MFD) fire dampers only.

Key Related Standards

- BE EN 1366-2:2015 Fire resistance tests for service installations - Fire dampers
- BS EN 1363-1:2020. Fire resistance tests. General requirements
- BS EN 1364-1:2015. Fire resistance tests for non-loadbearing elements. Walls
- BS EN 13501–3: Fire classification of construction products and building elements: fire resisting ducts and fire dampers
- BS EN 15650: Ventilation for buildings – Fire dampers
- BS EN 15882-2:2015 Extended application of results from fire resistance tests for service installations. Fire dampers
- DW145 Installation of Fire and Smoke Dampers
- TR19 Internal Cleanliness of Ventilation systems

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0	1	2	3	4	5	6	7
Strategic Definition	Preparation and Brief	Concept Design	Spatial Coordination	Technical Design	Manufacturing Construction	Handover	Use

Requirements

AIR

Gateways

Model

AIM

Asset Information Requirements

Project Information Model

Digital O&M

AIM

Manufacturer Product Libraries

Standard Libraries and Validation

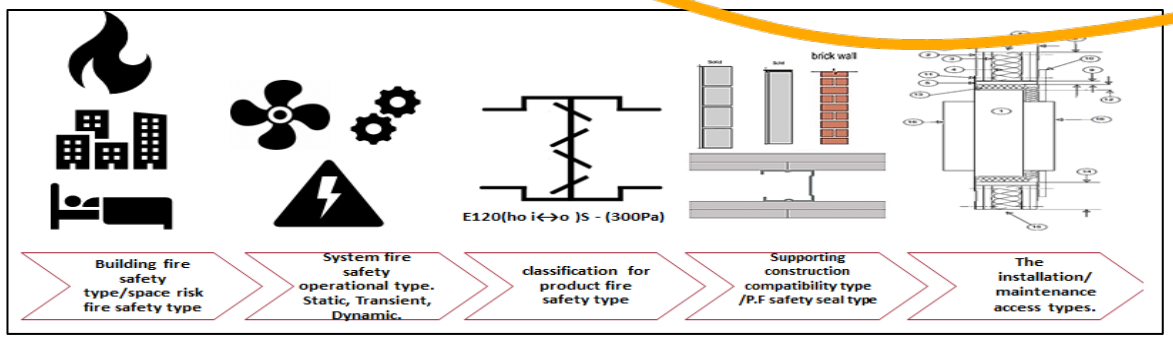
Digital Construction Design Management, Health and Safety, Operating and Maintenance

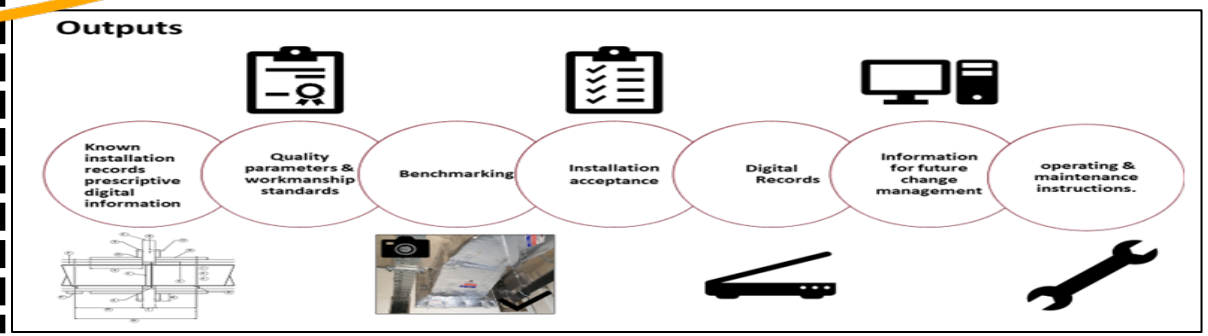
Building Standards and Regulations

Descriptive (QA)

Prescriptive (QC) and change

Use and Change





The Process required for descriptive Fire Dampers.

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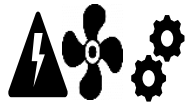
The Process required for descriptive Fire Dampers.

Simplification of the below flow diagram follows.

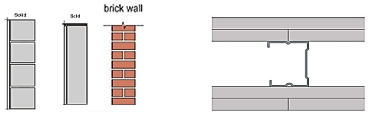
Building purpose group/fire safety space risk



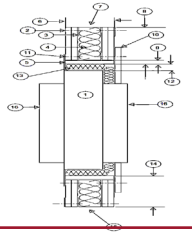
System fire safety operational type. Static, Transient, Dynamic.

E120(ho i↔o)S - (300Pa)

classification for product fire safety type



Supporting construction compatibility type /P.F safety seal type



The installation/maintenance access types.

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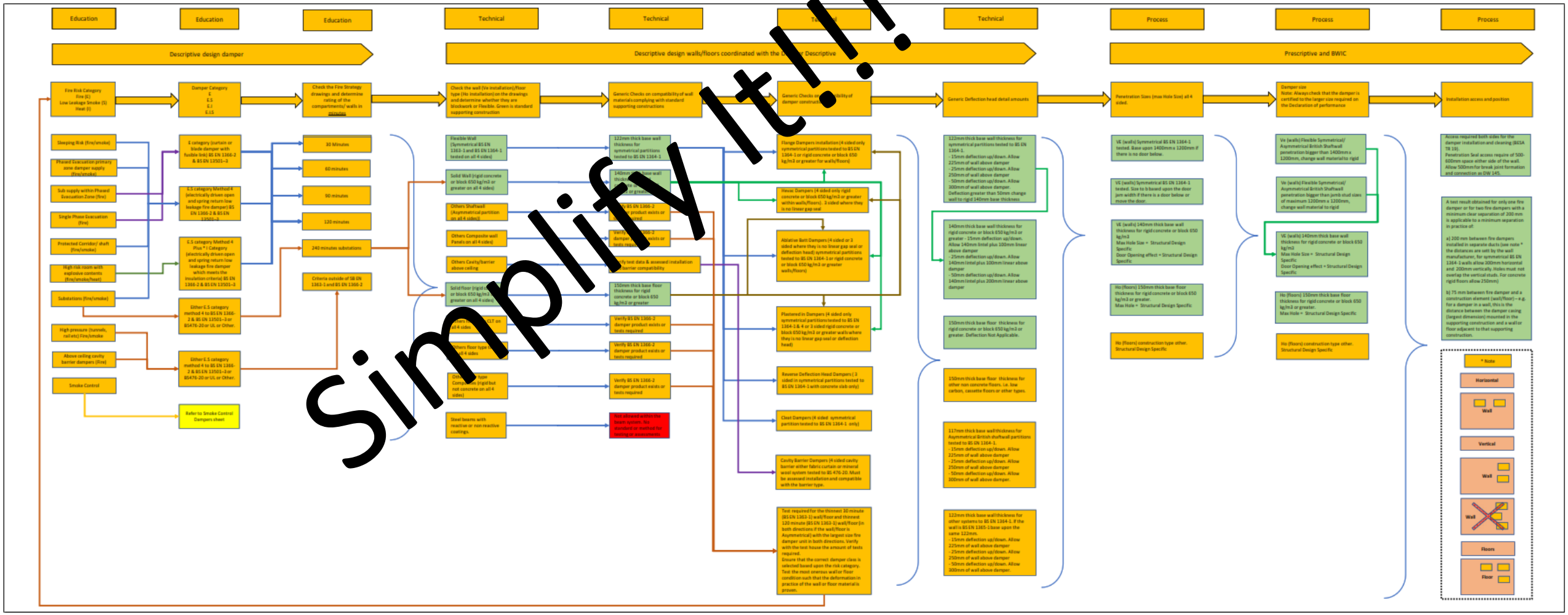
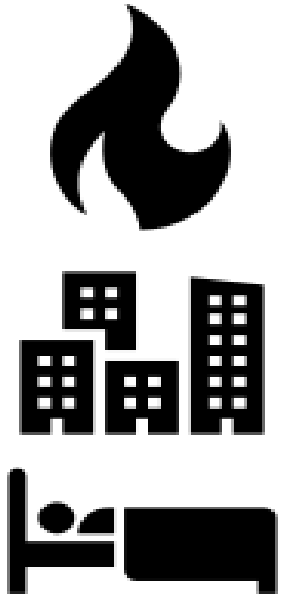
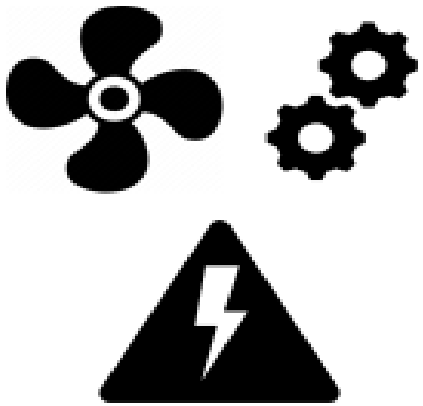
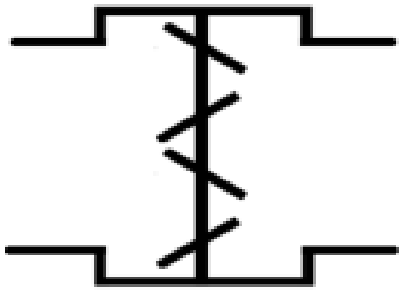


TECHNICAL Quality Assurance. Setting of the appropriate product for the circumstances. Any change is ‘major’ once this has been formulated.

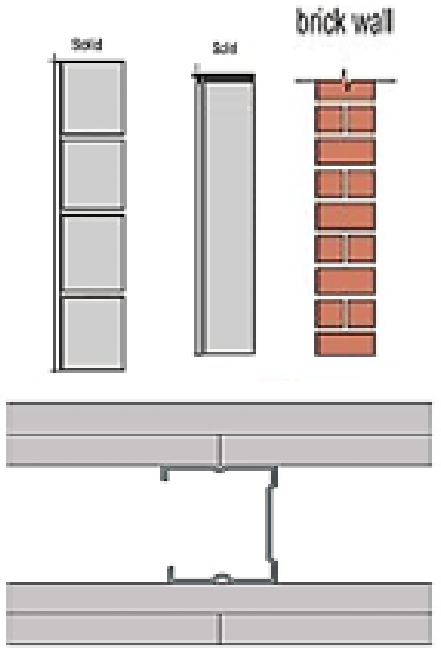
The Process required for descriptive Fire Dampers

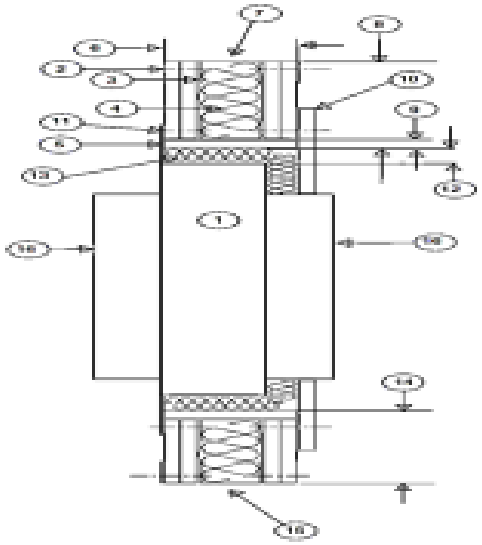






E120(ho i↔o)S - (300Pa)





Building fire safety type/space risk fire safety type

System fire safety operational type. Static, Transient, Dynamic.

classification for product fire safety type

Supporting construction compatibility type /P.F safety seal type

The installation/ maintenance access types.

**Building Regulations Functional Requirements, Approved Documents: Part L, O, F, B.

* Culmination of all product types to verify the appropriate wall type.

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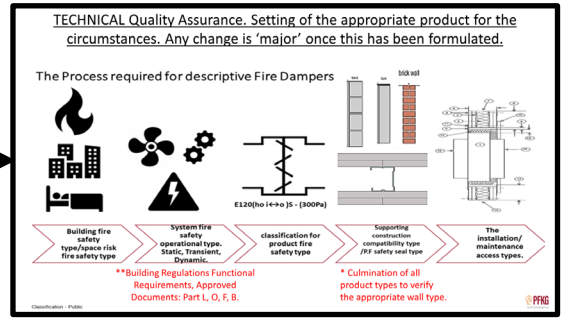
**Design of system to components to meet all functional requirements of the Building Regulations

Operational type.** Building Regulations Functional Requirements, Approved Documents: Part L, O, F, B.



Part L. Evidence that the system energy performances are within the limits of the calculated performance.

Part O. Evidence that the system performance will prevent overheating where designed to do so.

Part F. Evidence that the system performance will supply reasonable levels of ventilation.

Part B. Evidence that the systems fire prevention devices do not impeded Parts, L, O, F and meet the space risk requirements

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* Culmination of all product types to verify the appropriate wall type. System approach

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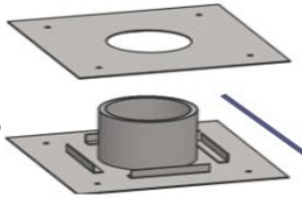
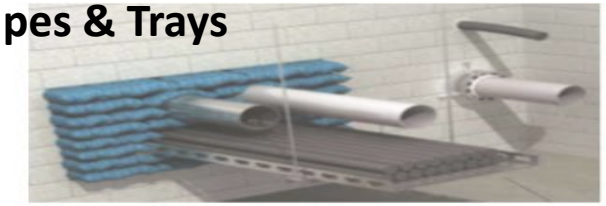
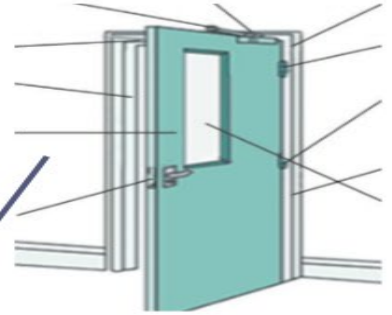
Flues



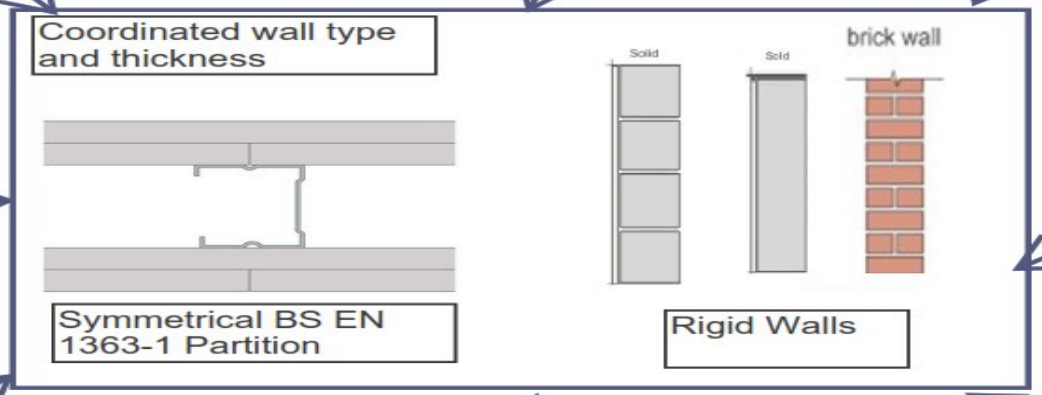
Pipes & Trays

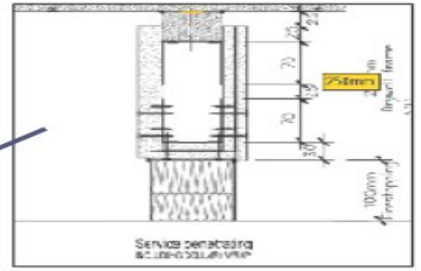




Fire Doors
Lift Doors

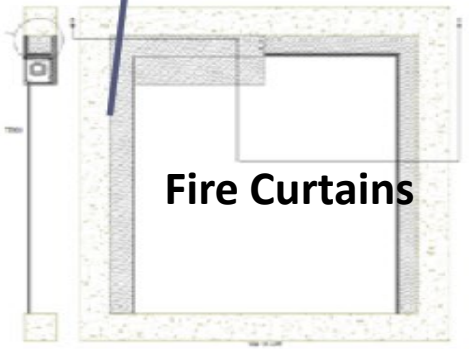
Fire Dampers
Smoke Control Dampers



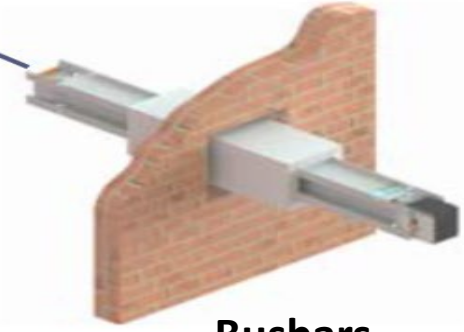


Wall Types

Fire Resistant Ducts
Smoke extract ducts
Cable Encapsulation

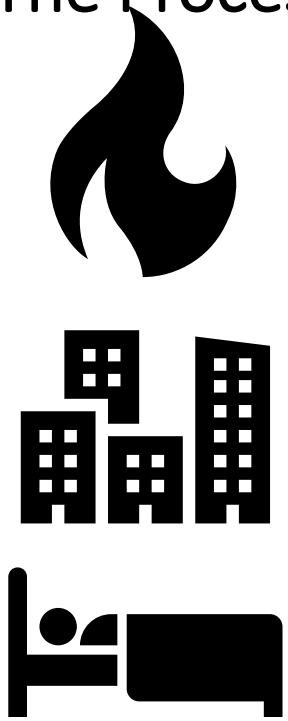


Fire Curtains

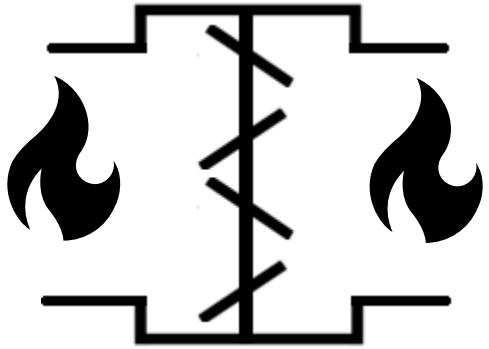


Busbars

The Process required for descriptive Fire Dampers



Building purpose group/fire safety space risk .



1 Preparation and Briefing

Gateway points

2 Concept Design

Establish the building fire safety purpose group type

Establish the building fire safety shape

Establish the building fire safety form

Review lessons learned from previous projects

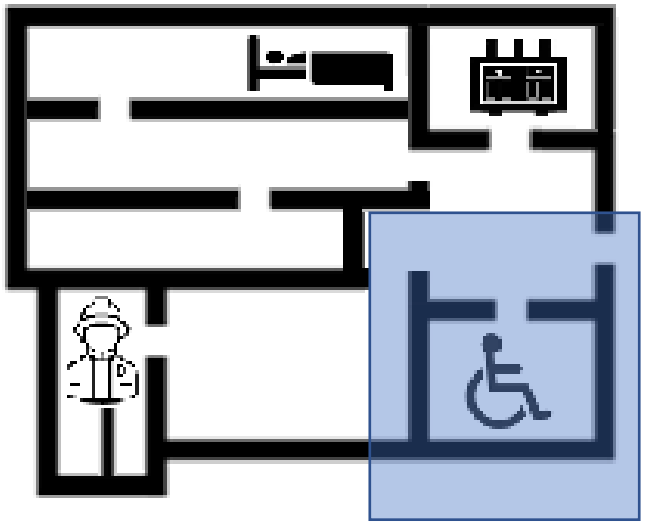
Establish the building passive fire safety review team

Establish the fire safety space risk types

System fire safety operational type. Static, Transient, Dynamic.

Example:

Refuge in protected corridor with supply air and extract. Mark in blue.



Building purpose group/fire safety space risk

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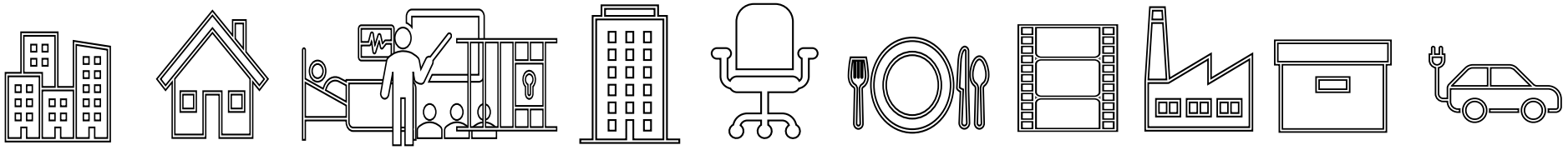
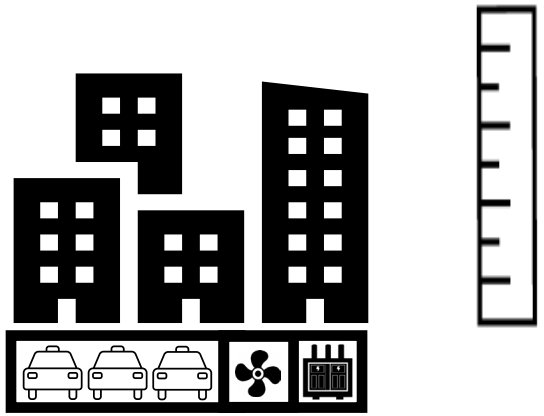
Purpose Groups

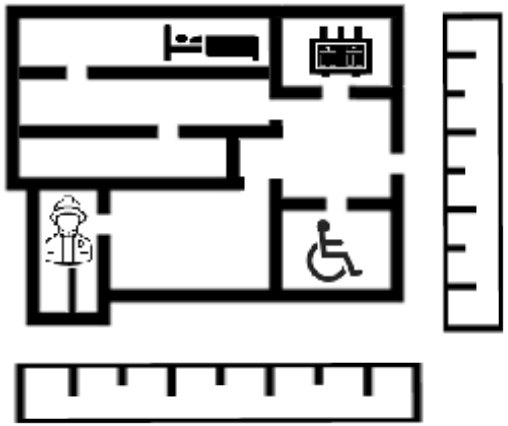


1 a | 1 b/c | 2 a | 2 b | 3 | 4 | 5 | 6 | 7a | 7b

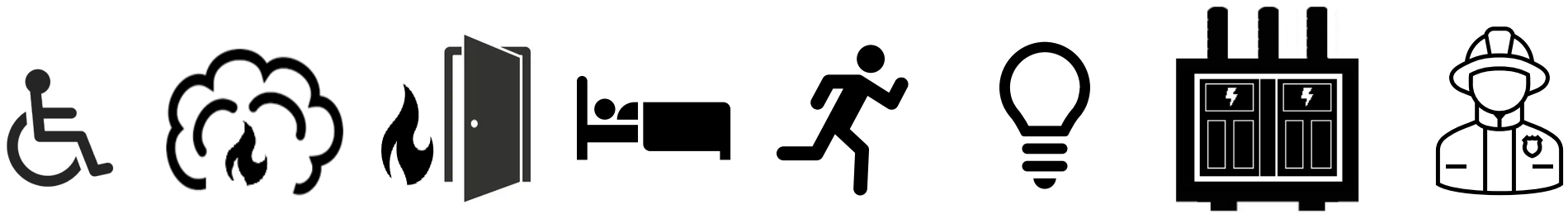
Shape



Form & Space type



Space Risks



Refuge | Smoke | Fire | Sleeping | Evac Type | Lighting | Power | Fire Fighting

Building purpose group/fire safety space risk

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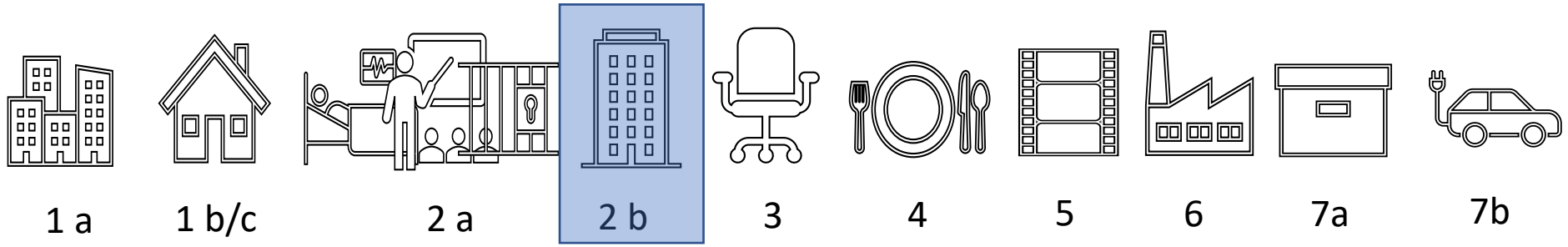
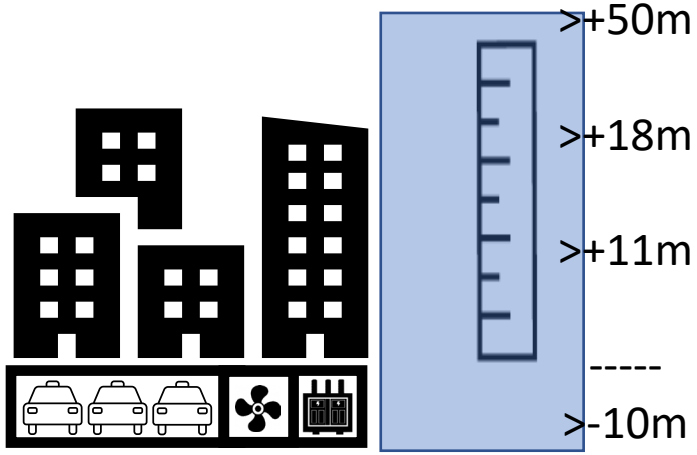
Purpose Groups

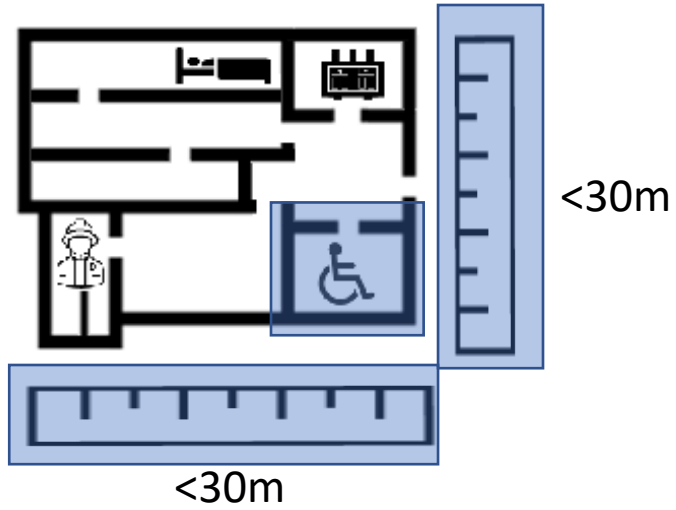


1 a | 1 b/c | 2 a | 2 b | 3 | 4 | 5 | 6 | 7a | 7b

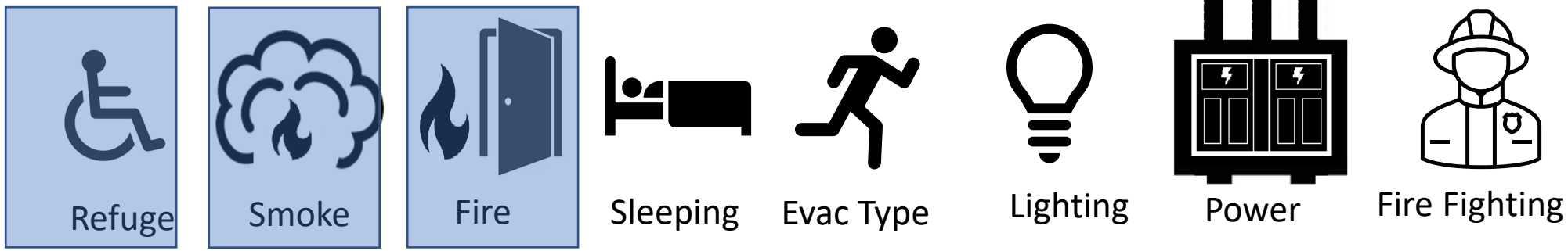
Shape



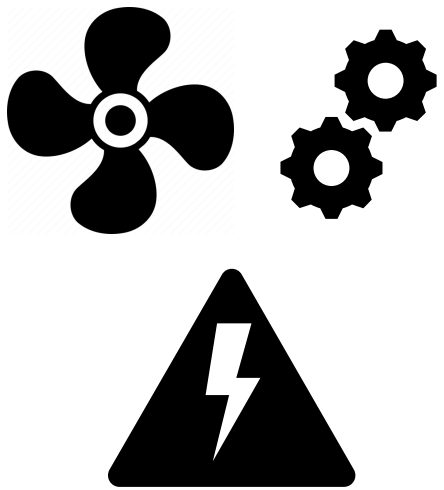
Form & Space type



Space Risks

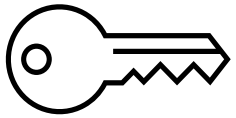


The Process required for descriptive Fire Dampers



System fire safety operational type. Static, Transient, Dynamic.

Building purpose group/fire safety space risk

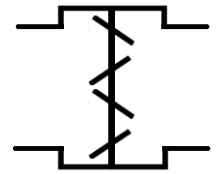


Gateway points

Establish the passive fire systems operational types

Establish the Passive fire safety time ratings

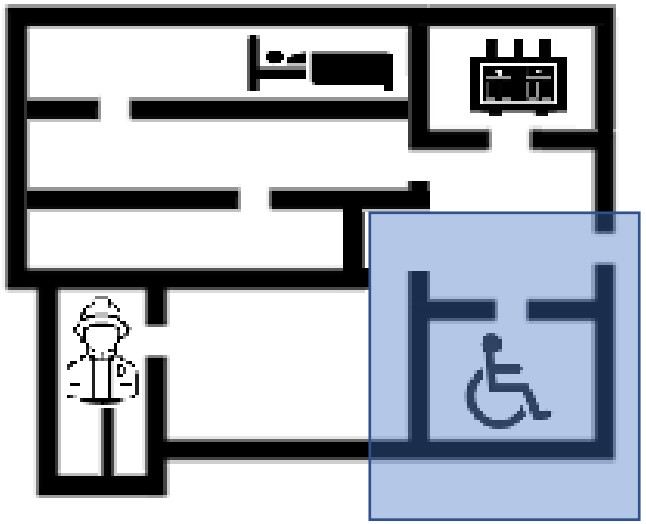
classification for product fire safety type



E120(ho i↔o)S - (300Pa)

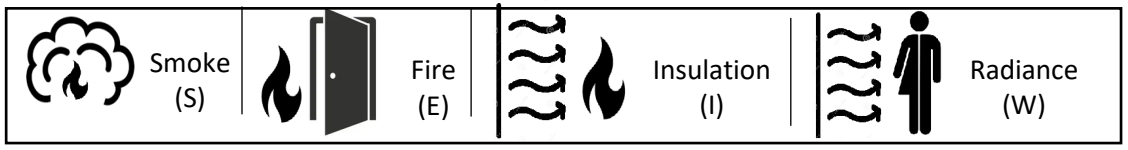
Example:

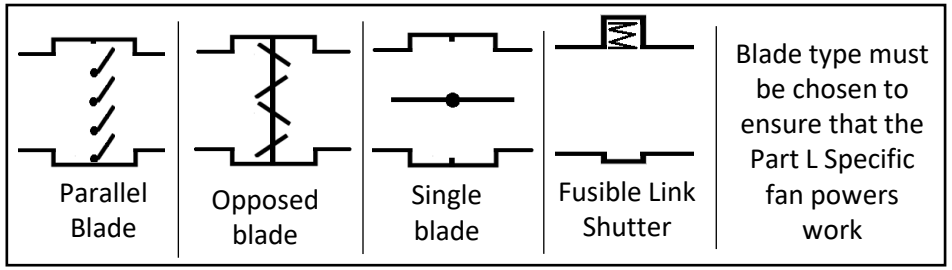
Refuge in protected corridor with supply air and extract.

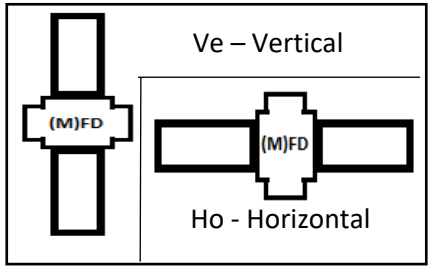


System fire safety operational type. Static, Transient, Dynamic.

Space Type	Risk	Time	Operation	Blade types DP (AD: L)	Power and Fire Signals
Protected Corridor or Lobby		30-120 minutes	Automatic activated to closed position by fire alarm activation		Power Supply. Fire Alarm Interface.
Sleeping, Clinical		30-120 minutes	Automatic activated to closed position by fire alarm activation		Power Supply. Fire Alarm Interface.
Phased Evacuation		30-120 minutes	Automatic activated to closed position by fire alarm activation		Power Supply. Fire Alarm Interface.
Simultaneous Evacuation		30-120 minutes	Activated by fusible link at 72oc to closed position		No requirement
Power Critical supplies		30-120 minutes	Activated by fusible link at 72oc to closed position		No requirement
Fire Fighting		30-120 minutes	Automatic activated to closed position by fire alarm activation		Power Supply. Fire Alarm Interface.







System fire safety operational type. Static, Transient, Dynamic.

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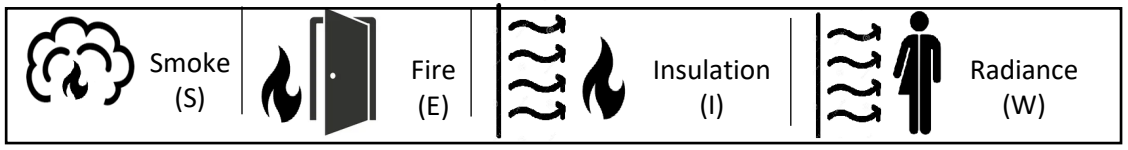
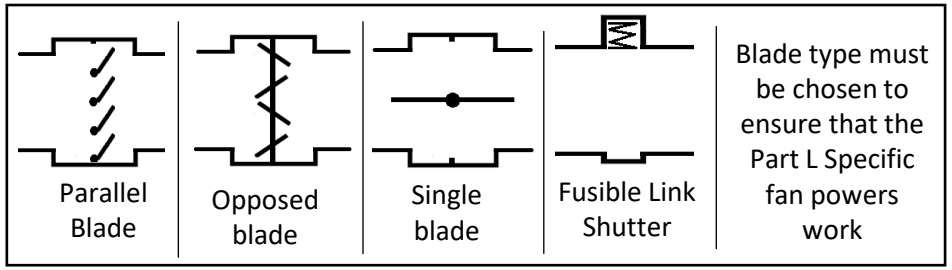
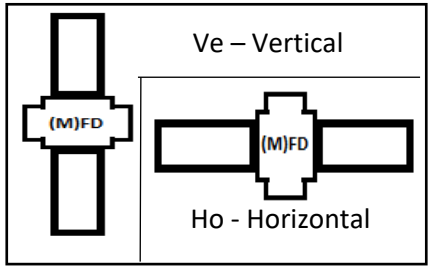
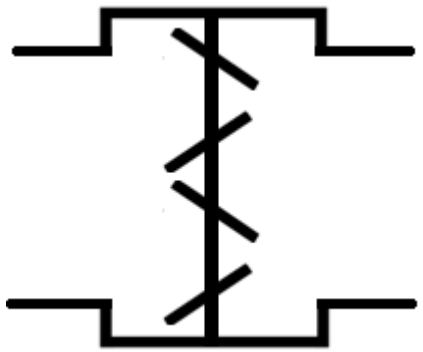






The Process required for descriptive Fire Dampers

PFKG
Passive Fire Knowledge Group



E120(ho i↔o)S - (300Pa)

classification for product fire safety type

2 Concept Design

3 Spatial Coordination

System fire safety operational type. Static, Transient, Dynamic.

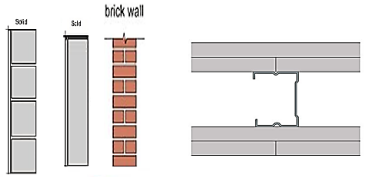
Establish the Passive fire safety classification types

Create the Passive fire safety systems Seal registers

Establish descriptive classification for product fire safety type

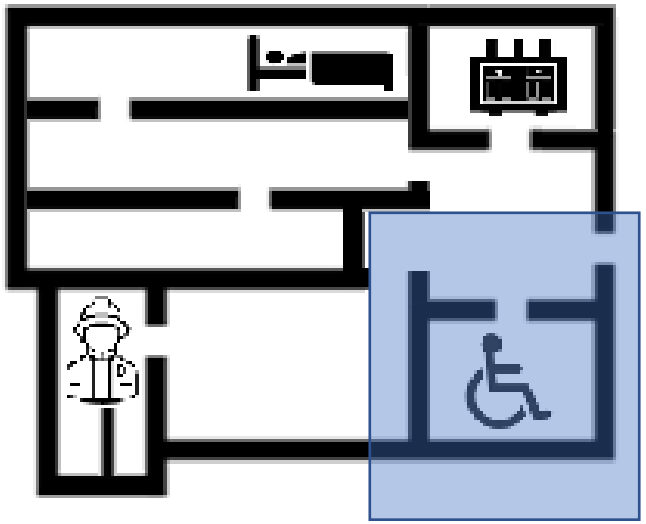
Supporting construction compatibility type /P.F safety seal type

Gateway points

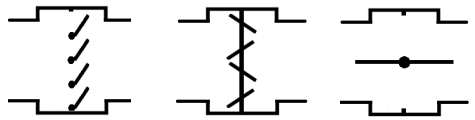
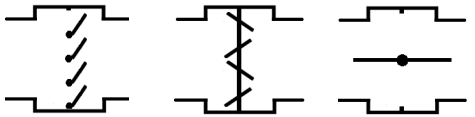
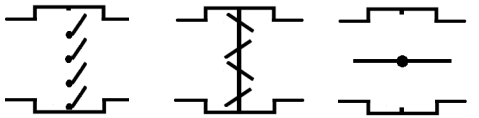
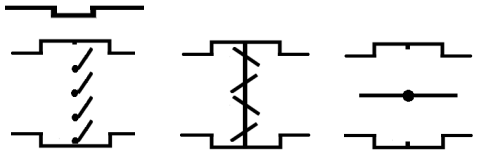


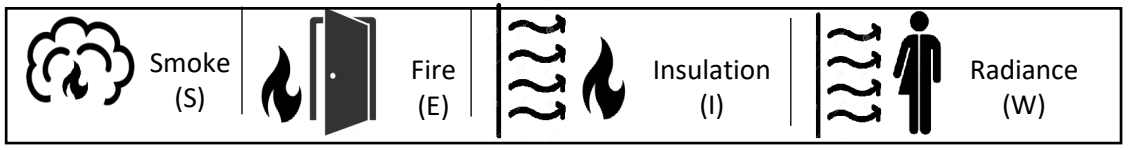
Example:

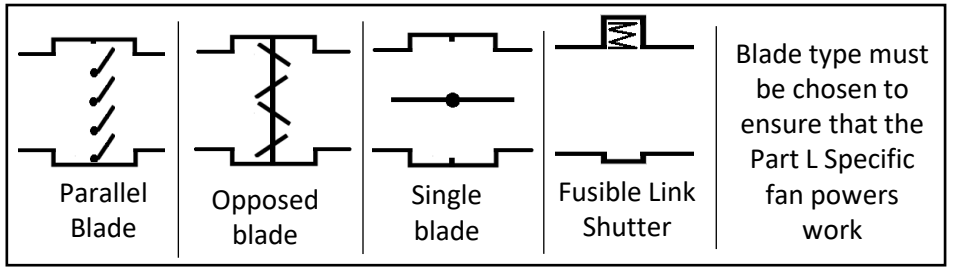
Refuge in protected corridor with supply air and extract.

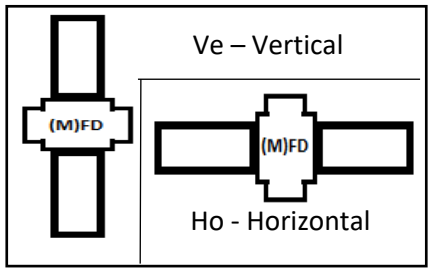


Classification for product fire safety type

Space Type	Risk	Time	Operation	Blade types DP (AD: L)	Direction of Fire	Plane of Fire	Cycling
Protected Corridor or Lobby	E.S	30-120	AD: B. Method 4		(i ↔ o)	Ve or Ho	Up to C10000
Sleeping, Clinical	E.S	30-120	AD: B. Method 4		(i ↔ o)	Ve or Ho	Up to C10000
Phased Evacuation	E.S	30-120	AD: B. Method 4		(i ↔ o)	Ve or Ho	Up to C10000
Simultaneous Evacuation	E	30-120	AD: B. Method 1		(i ↔ o)	Ve or Ho	
Power Critical supplies	E	30-120	AD: B. Method 1		(i ↔ o)	Ve or Ho	
Fire Fighting	E.S	30-120	AD: B. Method 4		(i ↔ o)	Ve or Ho	Up to C10000







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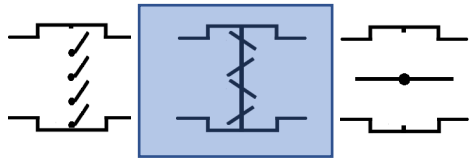
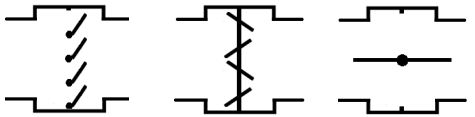
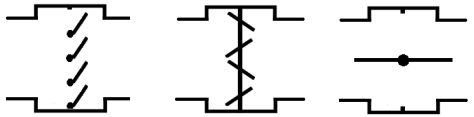
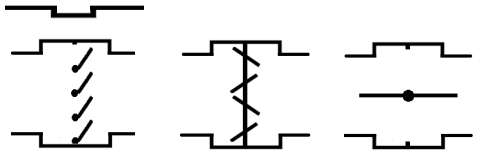
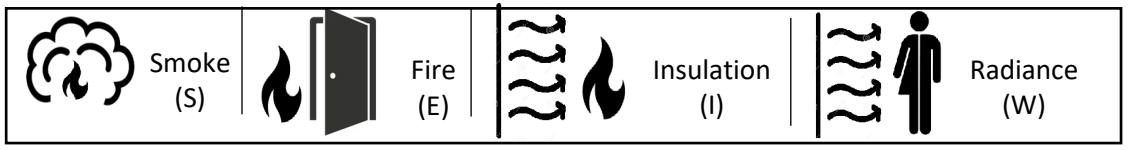
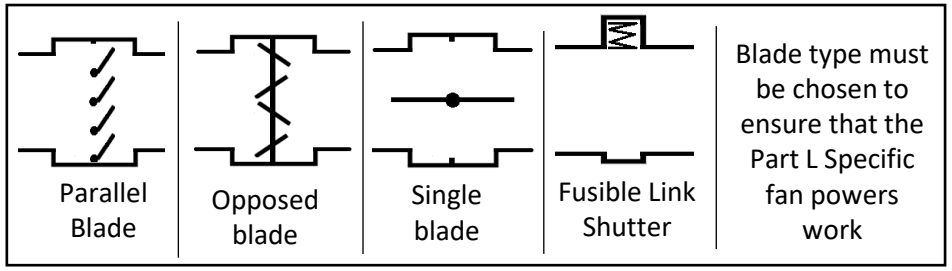
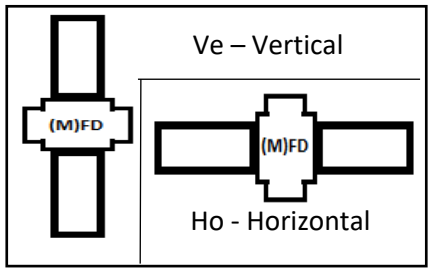
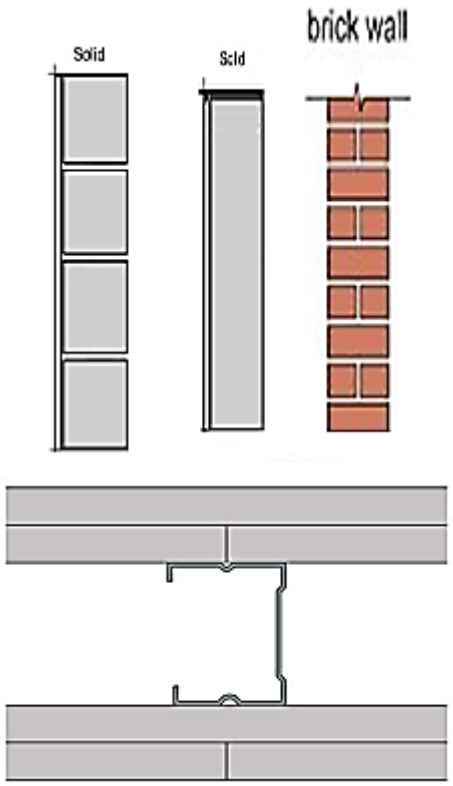
Space Type	Risk	Time	Operation	Blade types DP (AD: L)	Direction of Fire	Plane of Fire	Cycling
Protected Corridor or Lobby	E.S	30-120	AD: B. Method 4		(i ↔ o)	Ve or Ho	Up to C10000
Sleeping, Clinical	E.S	30-120	AD: B. Method 4		(i ↔ o)	Ve or Ho	Up to C10000
Phased Evacuation	E.S	30-120	AD: B. Method 4		(i ↔ o)	Ve or Ho	Up to C10000
Simultaneous Evacuation	E	30-120	AD: B. Method 1		(i ↔ o)	Ve or Ho	
Power Critical supplies	E	30-120	AD: B. Method 1		(i ↔ o)	Ve or Ho	
Fire Fighting	E.S	30-120	AD: B. Method 4		(i ↔ o)	Ve or Ho	Up to C10000







The Process required for descriptive Fire Dampers



Supporting construction compatibility type /P.F safety seal type

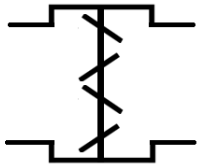
Vertical Symmetrical Flexible – EN520

Vertical or Horizontal Rigid – Concrete/ Block > 650 kg/m3

All other types are classed as 'Other' and required appropriate test data.

3 Spatial Coordination

Gateway points



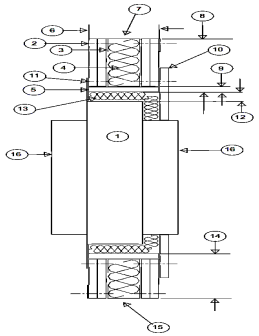
E120(ho i↔o)S - (300Pa)

classification for product fire safety type

Establish fire safety descriptive supporting construction compatibility type

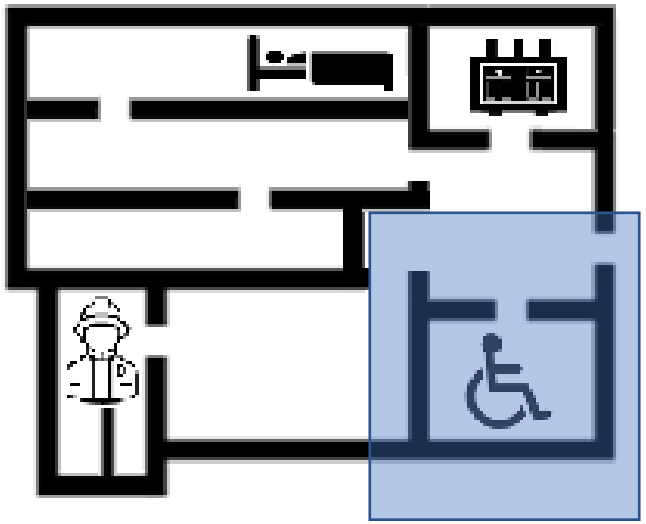
Establish the passive fire safety seal descriptive type

The installation/maintenance access types.



Example:

Refuge in protected corridor with supply air and extract.



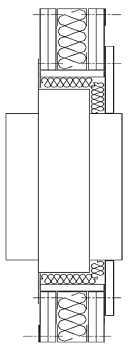
Supporting construction compatibility type /P.F safety seal type

Classification

E120 (VE i ↔ o)S C10000

Protected Corridor or Lobby

Frame Type



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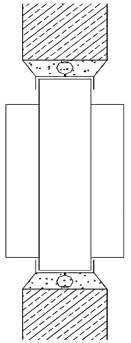
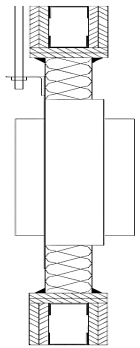
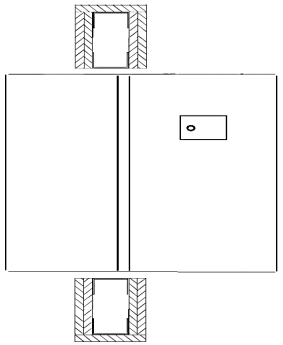


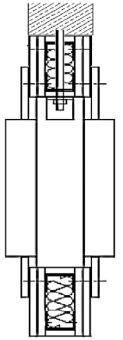
Cast In



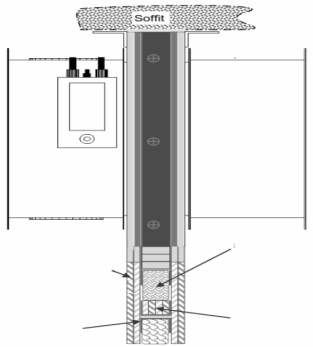
Ablative Batt



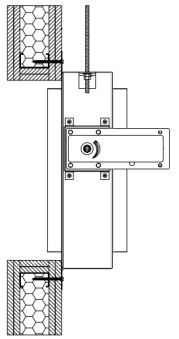
Plastered In



Cleats In Wall



Reverse Deflection Head

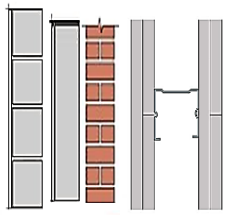


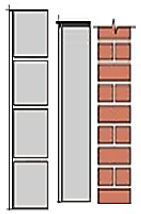
On Wall

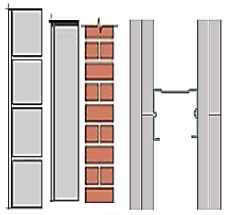
Vertical Symmetrical Flexible – EN520

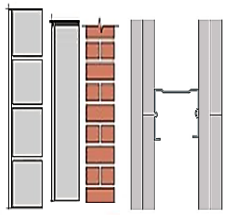
Vertical or Horizontal Rigid – Concrete/ Block > 650 kg/m3

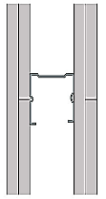
Wall System Type

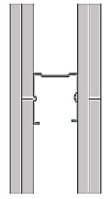


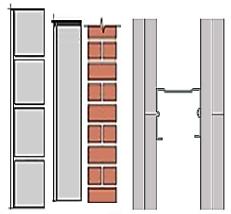












All other types of wall or floor are classed as "Other" and require supporting test and classification data.

Wall Thickness is specific to test arrangement

Wall Thickness

Check with the damper manufactures DOP and compare with other wall system products DOP to ascertain the thickness for all system components (I.E. Doors, FR Ducts, Flues, Glass Screens, Pipework, Busbar, FR Cable Containment Systems)

Aperture Framing & Passive Seal specific to test arrangement

Seal Type

EN520 & Mineral Wool	4:1 Sand and Cement	Test Specific Batt & Mastic	Gypsum Plaster specific to test	EN520 overboard	Test Specific Wall Kit	EN520 Aperture Framed

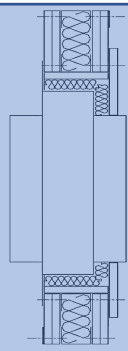
Supporting construction compatibility type /P.F safety seal type

Classification

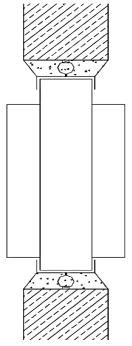
E120 (VE i ↔ o)S C10000

Protected Corridor or Lobby

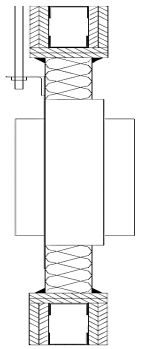
Frame Type



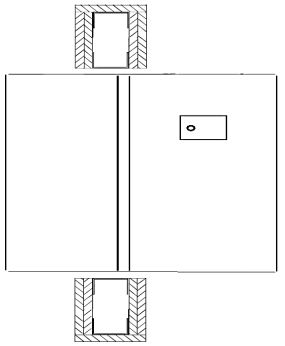
Flanged



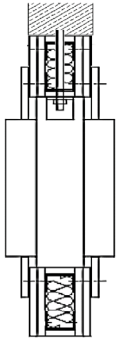
Cast In



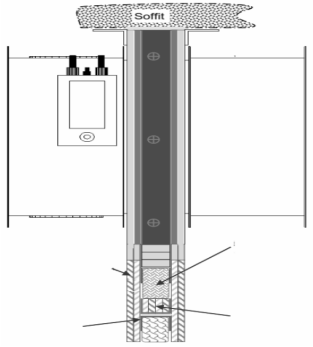
Ablative Batt



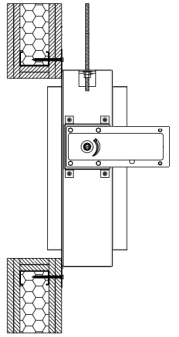
Plastered In



Cleats In Wall



Reverse Deflection Head

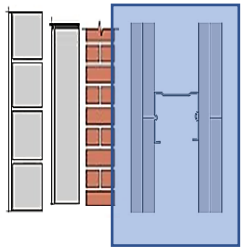


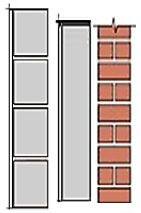
On Wall

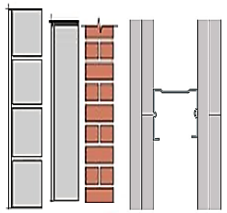
Vertical Symmetrical Flexible – EN520

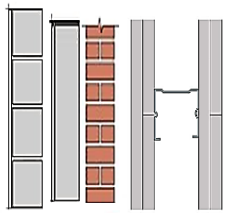
Vertical or Horizontal Rigid – Concrete/ Block > 650 kg/m3

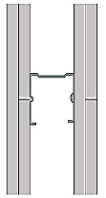
Wall System Type

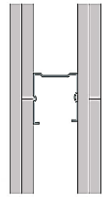


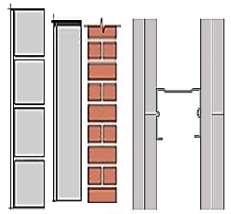












All other types of wall or floor are classed as "Other" and require supporting test and classification data.

Wall Thickness is specific to test arrangement

Wall Thickness

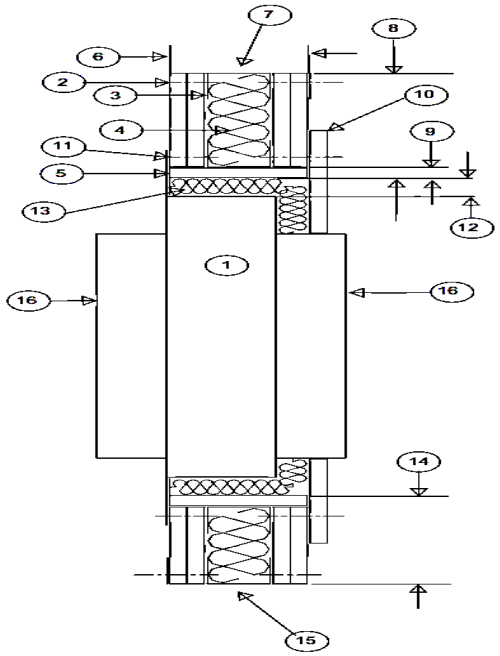
Check with the damper manufactures DOP and compare with other wall system products DOP to ascertain the thickness for all system components (I.E. Doors, FR Ducts, Flues, Glass Screens, Pipework, Busbar, FR Cable Containment Systems)

Aperture Framing & Passive Seal specific to test arrangement

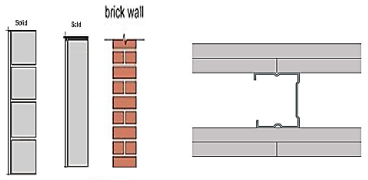
Seal Type

EN520 & Mineral Wool	4:1 Sand and Cement	Test Specific Batt & Mastic	Gypsum Plaster specific to test	EN520 overboard	Test Specific Wall Kit	EN520 Aperture Framed

The Process required for descriptive Fire Dampers



The installation/ maintenance access types.



3 Spatial Coordination

Supporting construction compatibility type /P.F safety seal type

Gateway points

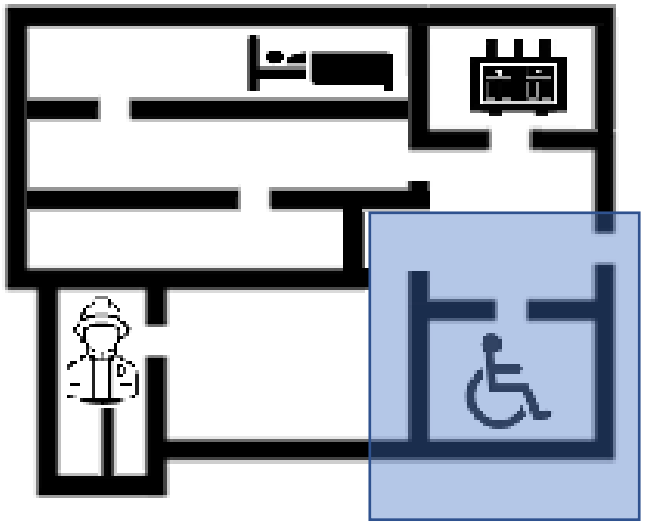
Establish the Passive Fire seal installation & maintenance access and sequence

Add the Passive Fire Seals BWIC information to the seal register

Confirm spatial coordination of systems using prescriptive products

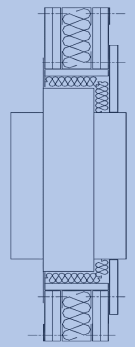
Example:

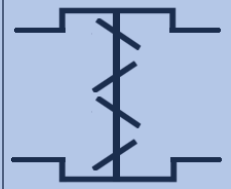
Refuge in protected corridor with supply air and extract.

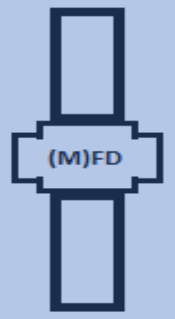


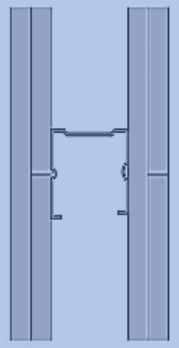
The installation/maintenance access types

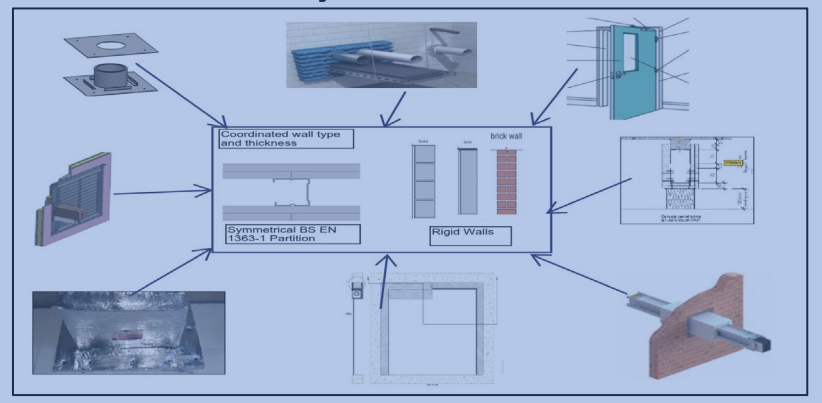
Classification	Damper Frame	Blade types DP (AD: L)	Wall Position	Wall Type	Wall System Thickness	Seal Type
E120 (VE i ↔ o)S C10000 Protected Corridor or Lobby	Flanged	Opposed	Ve – Vertical	Symmetrical Flexible – EN520	122mm (example determination)	EN520 & Mineral Wool

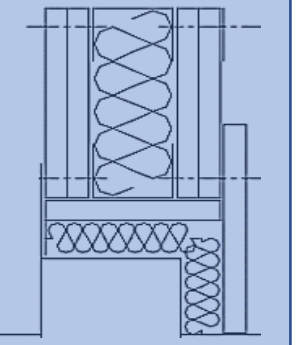




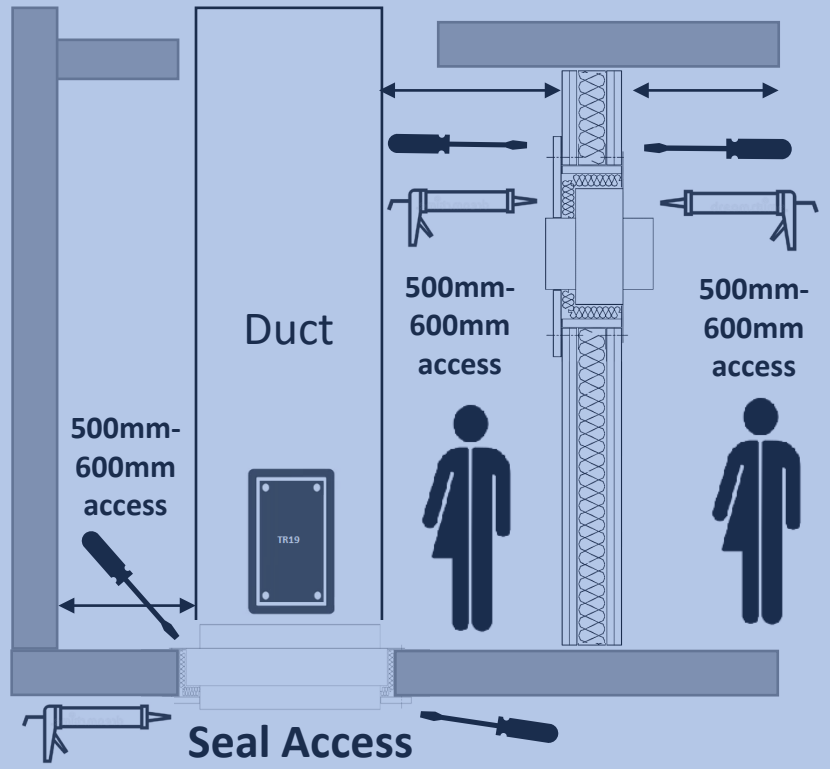




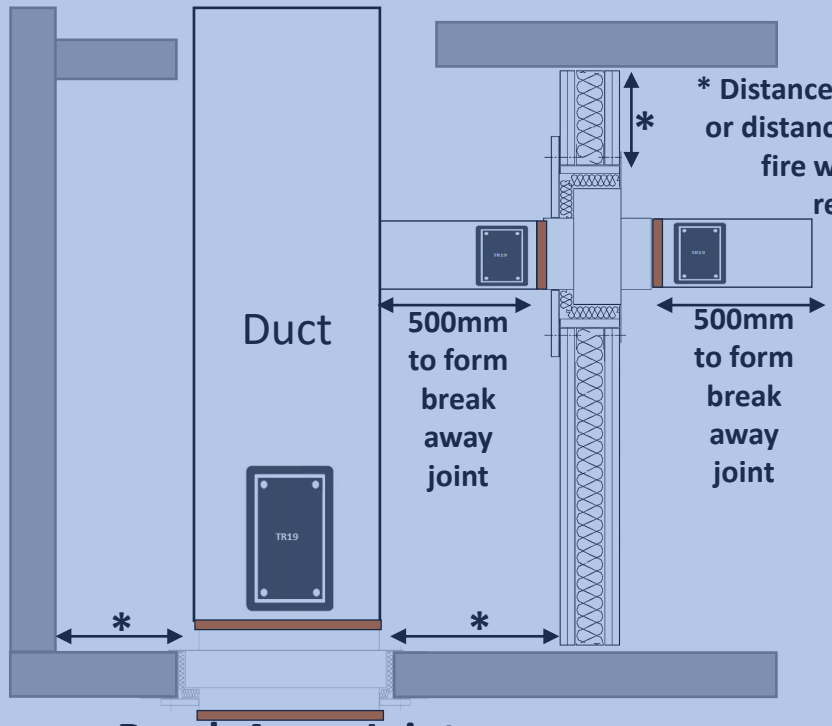




Installation Requirements

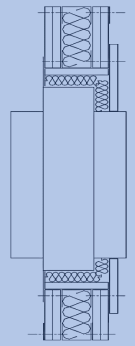
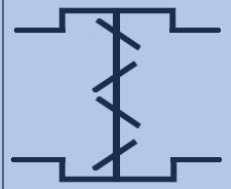
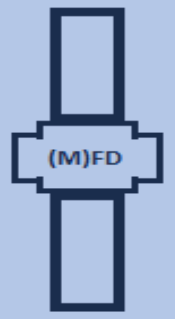
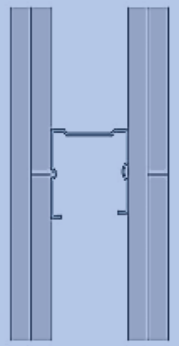
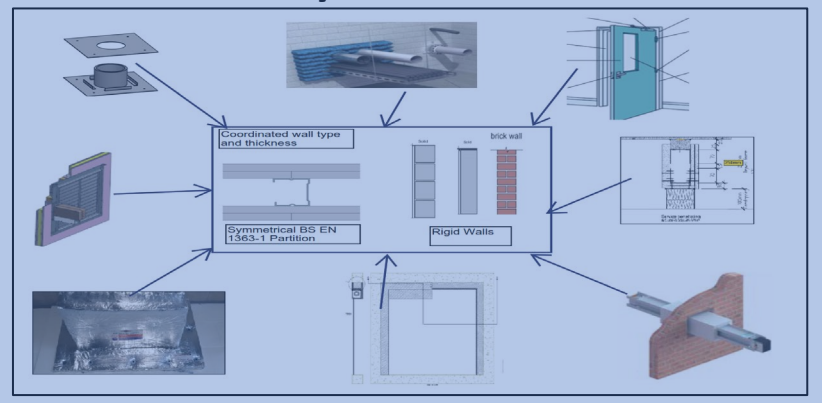
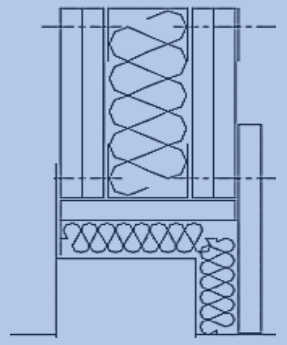


Seal Access



Break Away Joints

Descriptive Complete – Fire Damper

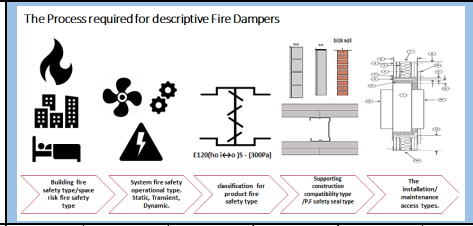
Classification	Damper Frame	Blade types DP (AD: L)	Wall Position	Wall Type	Wall System Thickness	Seal Type
E120 (VE i ↔ o)S C10000 Protected Corridor or Lobby	 Flanged	 Opposed	 Ve – Vertical	 Symmetrical Flexible – EN520	 122mm (example determination)	 EN520 & Mineral Wool

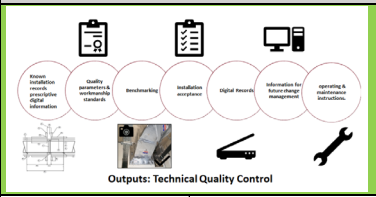
Classification

E | 120 | VE | i ↔ o | S | C10000

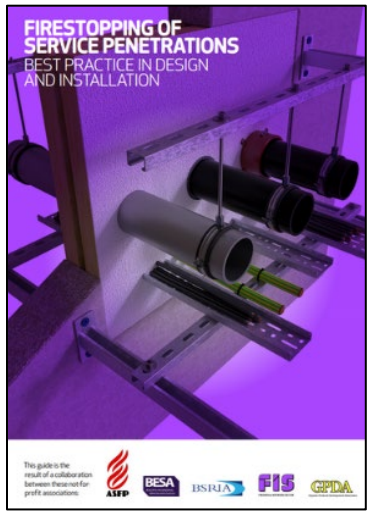
Scheduling of products – Fire Dampers

PFKG
Passive Fire Knowledge Group

Damper and wall schedule Rev 00001			Compartment fire resistance period (15-240)	Wall or Floor Location Reference	Type	Sleeping risk	Phased Evacuation primary zone damper	Sub supply within Phased Evacuation Zone	Single Phase Evacuation	Protected Corridor	High risk room with explosive contents	Compartment Rating	Horizontal (Ho) or Vertical (Ve)	Tested Both Ways Only	MFD Cycles	Blade Type (Part L)	Free Area (part F)	Installation method	Bespoke	Wall Type (compatibility check)		Duct size	
							Technical Qaulity Assurance (use 5 point work book selection)												
Damper schedule Ref	Drg Ref	Location	15,30,45,60,90,120,240 (minutes)	Use a locator that can be used on all should schedules.	FD (E category) / MFD (E.S Category)	E.I.S category Method 4	E.S category Method 4	E category	E category	E.S category Method 4	E.S category Method 4 Plus * I Category	Minutes to BS EN 1363-1	Ho/Ve	i<->o	C10000	Curtain Parrallel Opposed Bladed Single Blade	xx%	Flange Dampers Hevac Dampers Ablative Batt Dampers Plastered in Dampers Reverse Deflection Head Dampers Cavity Barrier Dampers Cleat Dampers On Wall	Bespoke Application or other regulation 7 method (ISO or Test or PFP Assessment)	Rigid (concrete or block)	Symmetrical Partition. Must be at least a 2 hr wall. Check with Manufacturer	Thickness (must be equal of greater than the seal of the damper	Width (mm)	Height (mm)
Basement level dampers and walls																							
							yes					20	ve	yes	yes		50						

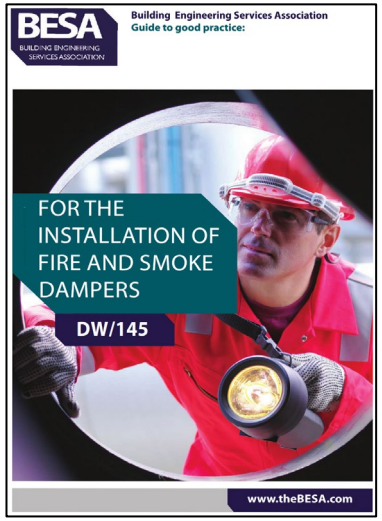
Product selection		Type	E- Resistance	Time	I - Resistance	Time	S- Resistance	Time	Horizontal (Ho) or Vertical (Ve)	Tested Both Ways Only	MFD Cycles	Blade Type (Part L)	Free Area	Frame Type	Damper Size		BWIC opening with tolerances as tested detail			Opening type vertica (Ve)			Opening type horizontal (Ho) (same supporting construction required on all sides)			Deflection amount	Deflection amount	Cleaning TR19	Breakaway joints	Installation Sides
		Technical Qaulity Control (use 7 point work book selection)																												
Manufacturer	Model	FD (E category) / MFD (E.S Category *)	E	15,30,45,60,90,120,240 (minutes)	I	15,30,45,60,90,120,240 (minutes)	S	15,30,45,60,90,120,240 (minutes)	Ho/Ve	i<->o	C10000	Curtain Parrallel Opposed Bladed Single Blade	xx%	Flange Dampers Hevac Dampers Ablative Batt Dampers Plastered in Dampers Reverse Deflection Head Dampers Cavity Barrier Dampers Cleat Dampers On Wall	Width (mm)	Height (mm)	Offset from floor (mm)	Width (mm)	Height (mm)	Depth (mm)	4 sided	3 sided	Other	4 sided	3 sided	Other	15, 25, 40, 50 etc mm	top or bottom ?	Both	Both	Both

Further Reading



Fire Stopping of Service Penetrations
Best Practice in Design and Installation

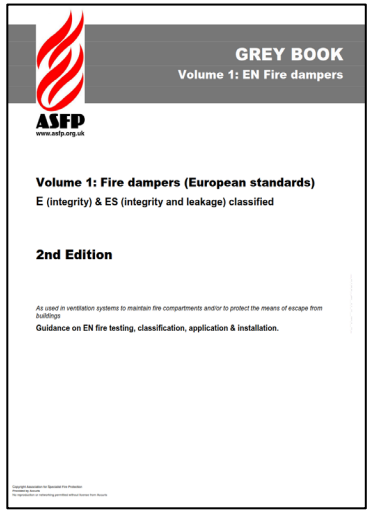
Free Download from ASFP, FIS, BSRIA and BESA



DW 145

For the installation of fire and smoke dampers.

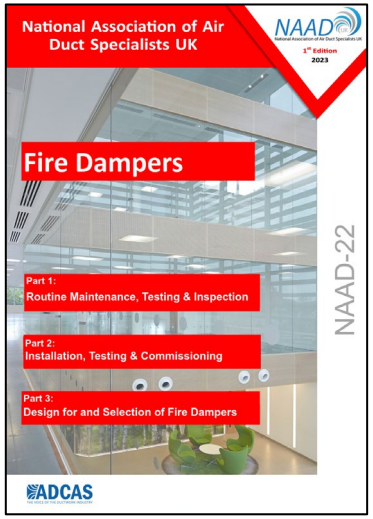
Available for download from BESA



ASFP Grey Book (2nd Edition)

Volume 1:
Fire dampers (European standards) E (integrity) & ES (integrity and leakage) classified

Available for download from ASFP



NAAD22

Fire Dampers

Available for download from NAADUK

PFKG

Passive Fire Knowledge Group

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