DIOHAS

Designers' Initiative Of Health And Safety

Meeting Record

Date	20th November 2023 (Mon), 16:30-18:00
Venue	Video conference using Microsoft Teams
Chair	Paul Bussey
Topic	Passive Fire Protection

Attendees	Name	Organisation
1	Paul Bussey (chair)	AHMM
2	Paul McSoley (guest speaker)	Mace
3	Will Pitt (guest speaker)	Laing O'Rourke
4	Richard Fordyce (guest speaker)	Laing O'Rourke
5	Agnieszka Rygolowska	?
6	Andrew Dean	Allies and Morrison
7	Andrew Gowing	Shedkm
8	Andrew Long	?
9	Andy Battle	SRA Architects
10	Angelica Piscopello	Murphy Philipps
11	Anthony McMahon	Morrow + Lorraine
12	Carlos Torrente	Weston Williamson + Partners
13	Chris Bracewell	DWA Architects
14	Chris Howe	Brooks Architects
15	Ciaran Gallagher	Hawkins Brown
16	Daniel Clift	MacCreanor Lavington
17	Danny Coomber	Harwood Cinstruction Consultancy
18	Darren Ghanie	Veretec
19	David Mulligan	RBKC
20	David Stanley	?
21	Fahima Akhter	?
22	Fran Watkins-White	Bureau Veritas
23	Gabrielle Flood	Suzie Bridges Architects
24	Gary Stoakes	?
25	Gary Walpole	National Federation of Roofing Contractors
26	Hugh Wray-McCann	Wray-McCann Architect
27	Ian Burgess	Adamson Associate
28	James Taylor	Nicholas Hare Architects
29	Jeffrey Tribich	Jeffrey Tribich Consulting
30	Jonathan Hodge	Fletcher Priest Architects
31	Justin Robinson	?
32	Kareem Wahid Sheik Mujibur Rehman	?
33	Luke Spencer	Hollis
34	Marcus Nelson	MEPK Architects
35	Marina Villalonga Bagan	?
36	Mark Taylor	Allies and Morrison
37	Mark Webb	Kier
38	Martin Touška	Rolfe Judd
39	Mirza Junaidullah Baig	?
40	Neil Molly	Levitt Bernstein
41	Nick Panayiotou	P&P Architects Ltd.
42	Niruja Jeyapalasingam	?
43	Paul Owen	BDP
44	Paul Strudwick	HKS Architects
45	Peter Hegarty	Chapman Taylor
46	Pav Singh Phull	Arcadis
47	Richard Price	Sweco
48	Richard Mills	Reardon Smith Architects

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49	Russell Smith	Project Four Safety
50	Seb.Laan Lomas	Architype
51	Aamir Shahzad	?
52	Shephard Ndlovu	University of Central Lancashire
53	Stefan von Strempel	?
54	Sarah Susman	PRP Architects
55	Suzie Bridges	Suzie Bridges Architects
56	Mathew Mallon	AHMM
57	Goh Ong	AHMM

NOTE ON COVID-19: Since 23rd March 2020, all DIOHAS meetings will take place over video conference.

Agenda

Three guest speakers discussing passive fire protection issues on architectural projects of all sizes. They are:

- Paul McSoley of Mace
- Will Pitt of Laing O'Rourke
- Richard Fordyce also of Laing O'Rourke

Recording

Link to the recording of the meeting:
https://youtu.be/4c6grA2EbUA

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MEP SERVICES PENETRATION SEALS BEST PRACTICE DESIGN AND SPECIFICATION

V1 June 2023

OBJECTIVE

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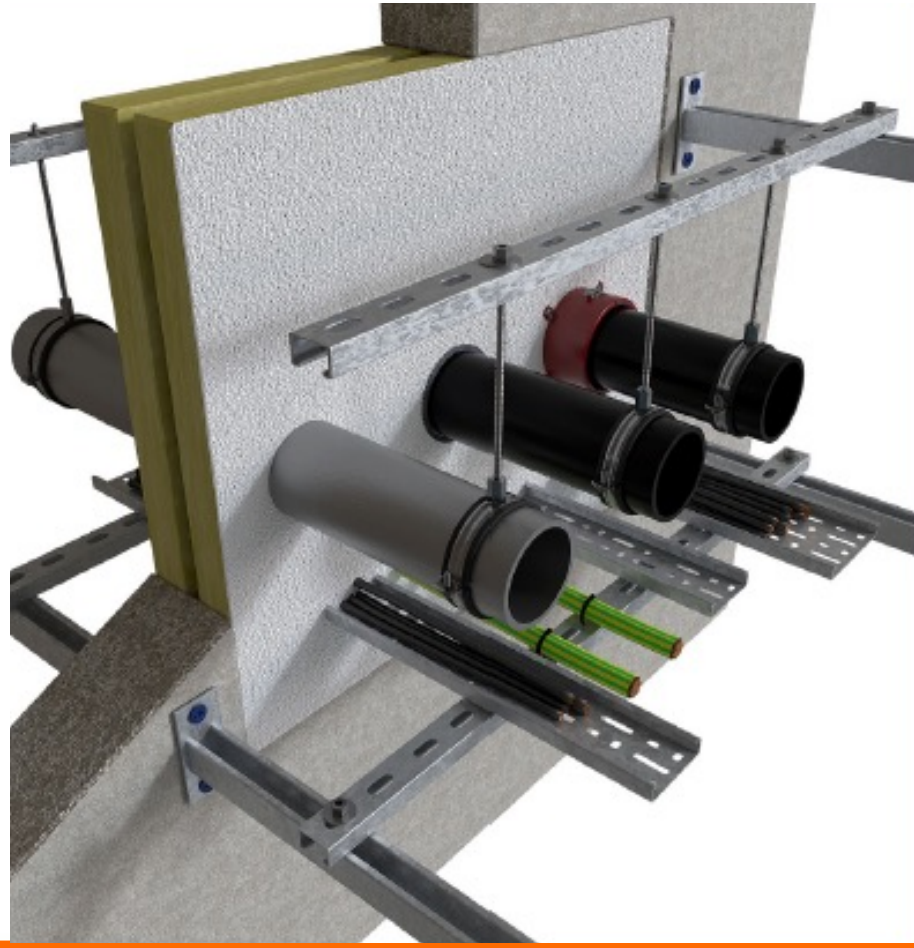
- The objective of this presentation it is illustrate a best practice approach to the design and specification of MEP services penetration seals where they pass through fire compartment walls or floors.
- The design and specification of MEP services penetration seals continues to be a significant challenge. Getting it right requires careful consideration and planning at all stages of the construction process, including critically at design stage when the architecture and building services are spatially planned.
- This guidance, which follows the RIBA Plan of Works 2020 is intended for all members of the design and professional team including architects, building services engineers, project managers and client stakeholders.



OVERVIEW

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- Whenever MEP services pass through fire compartment walls or floors, the penetration(s) must have a penetration seal to ensure that the overall fire resistance of the wall or floor is maintained.
- The best way to prove that a proposed penetration seal is suitable is to ensure that third party tested or certified manufacturer details are incorporated.
- Tested or certified penetration seal details are always based on spacing rules (e.g., setting out distances between services and between services and aperture edges).
- It is therefore essential that services are spatially planned to take this into account at design stage.
- In addition, tested or certified penetration seal details are always based on specific wall or floor build-ups and deviating from this will mean the penetration seal detail is effectively untested therefore unproven.
- Where the building services and architectural design has not taken into account the spacing requirements needed to facilitate the application of manufacturer tested or certified penetration seal details, it is likely that re-design will be needed. This may have significant knock-on implications to planning, programme, and cost.

OVERVIEW

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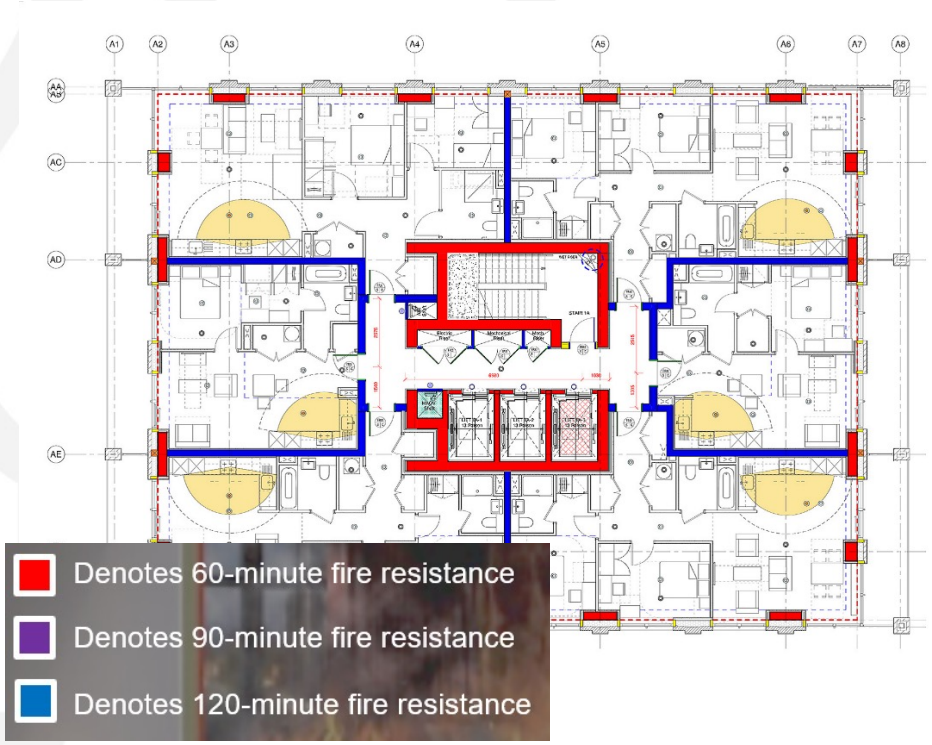
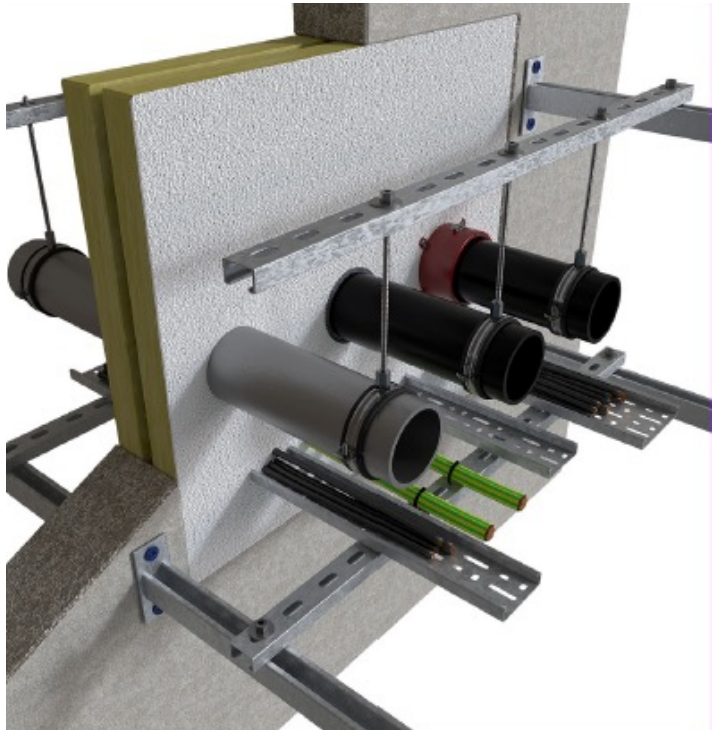


Example fire strategy drawing showing compartmentation layout



Example mixed-service penetration seal solution

RIBA Stage 3

3
Spatial Coordination

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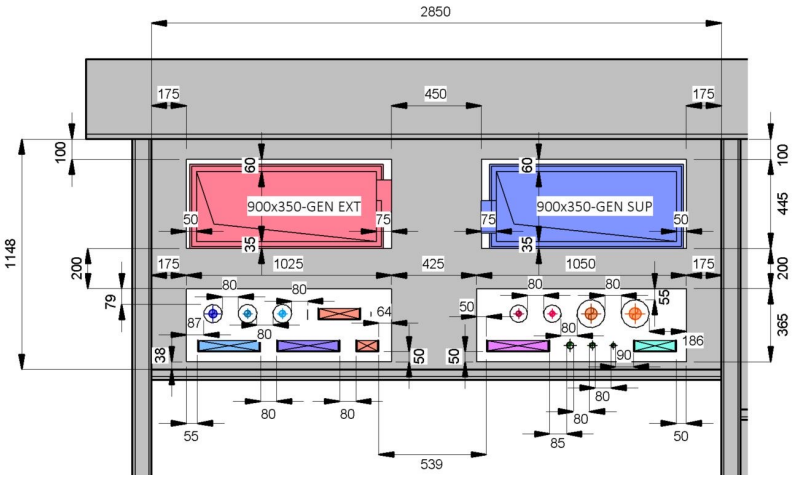
MEP design / model

- The MEP design must be developed based on penetration seal manufacturers third party tested or certified details
- At RIBA stage 3, where preferred manufacturers are yet to be defined, one solution is to develop the MEP services design based on generic spacing rules that accommodate the requirements of a range of manufacturers
- Where procurement routes allow, an alternative approach is to develop the design based on a specific penetration seal manufacturer, but there may be limitations
- Note: certain services such as fire resisting ducts, fire and smoke dampers, busbar, and flues should be in their own dedicated apertures and will usually require specific penetration seal details



Example showing MEP services spatially planned based on spacing rules

RIBA Stage 3

3
Spatial Coordination

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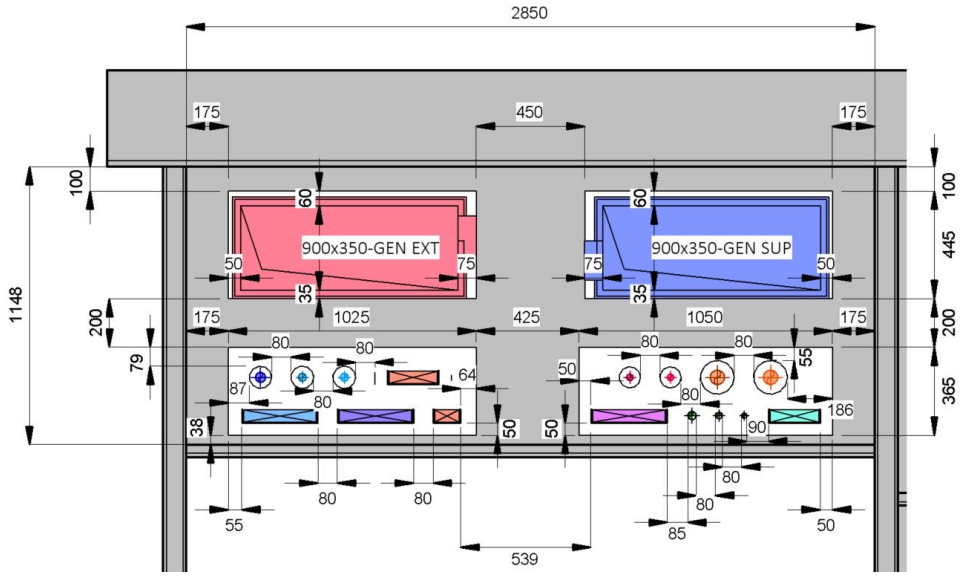
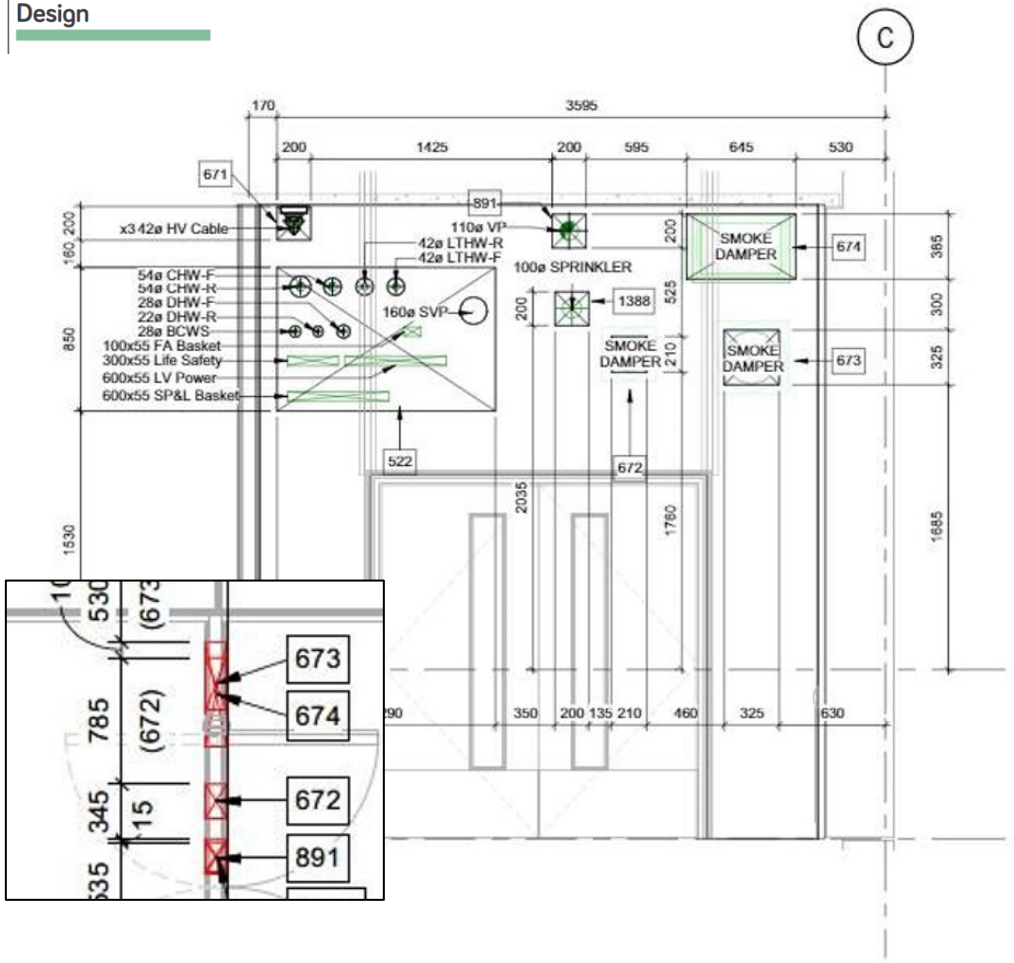


Architectural design / model

Once the MEP design has been updated to include penetration seal spacing rules, it is essential the architectural design / model is also updated to accommodate additional MEP penetration seal requirements.

RIBA Stage 4

4
Technical Design



Typical elevation and plan showing MEP builders work penetration positions and references

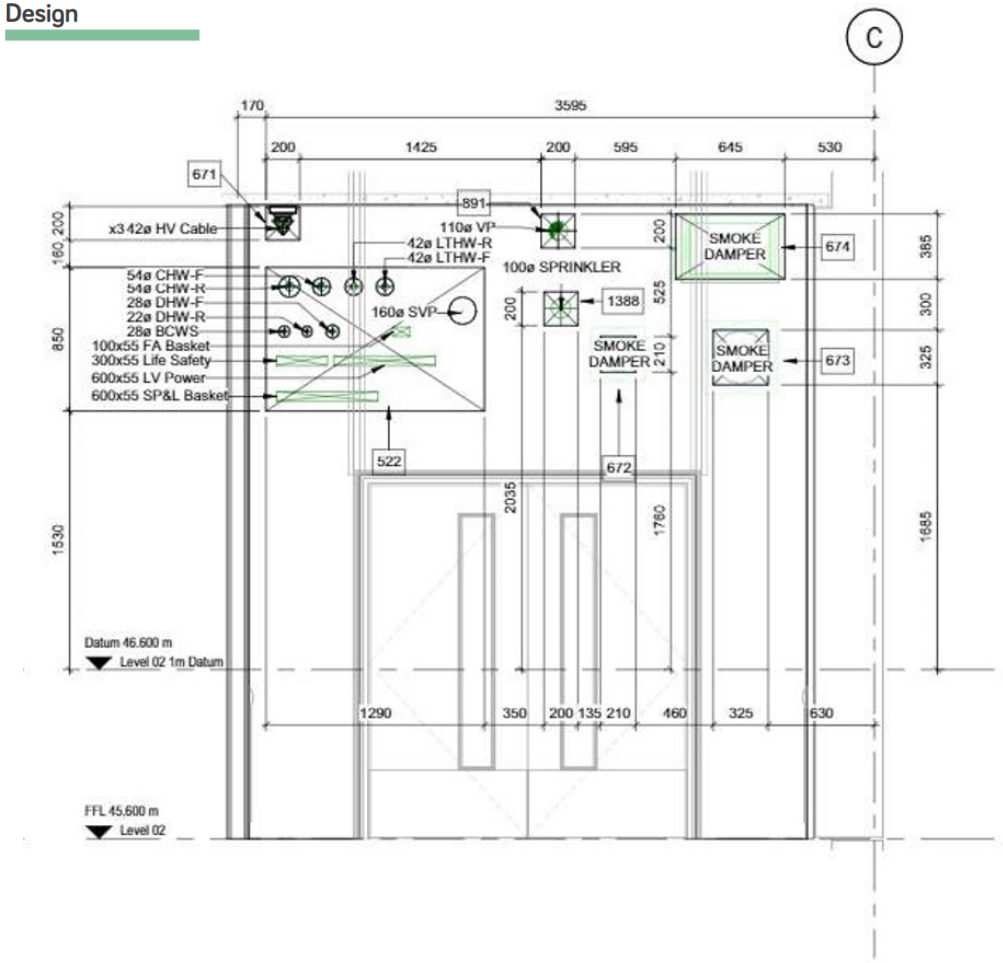
MEP design / model

- Co-ordinate MEP services incorporating penetration seal spatial requirements including details of specific services and separation distances
- Define aperture dimensions and approximate position in wall or floor
- Allocate a unique reference
- Issue to project architect for incorporation into architectural design model.

RIBA Stage 4

4

Technical Design



Architectural design / model

- Once the MEP design has been co-ordinated and includes penetration seal spacing rules, it is essential the architectural design / model is also updated to accommodate additional MEP penetration seal requirements

RIBA Stage 4

4
Technical Design

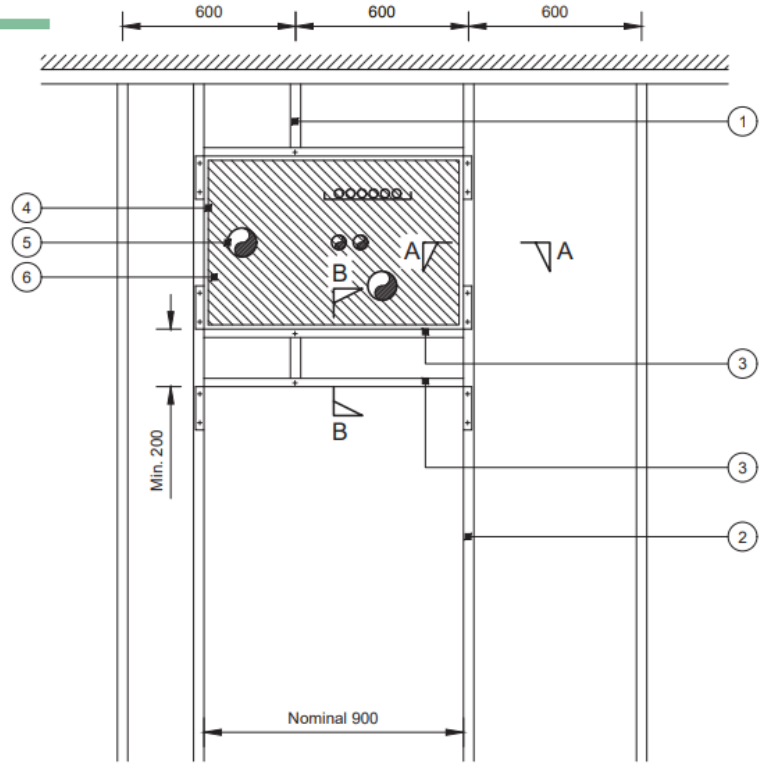
Architectural design / model

- Once the MEP design has been co-ordinated and includes penetration seal spacing rules, it is essential the architectural design / model is also updated to accommodate additional MEP penetration seal requirements
- Check MEP builders work positions for architectural clashes and advise any penetration repositioning or re-sizing

Guidance courtesy of Measom

RIBA Stage 4

4
Technical Design



Framework elevation (1:20)
Opening shown nominal 900 x 600mm

Image courtesy of British Gypsum

Architectural design / model

- Once the MEP design has been co-ordinated and includes penetration seal spacing rules, it is essential the architectural design / model is also updated to accommodate additional MEP penetration seal requirements
- Check MEP builders work positions for architectural clashes and advise any penetration repositioning or re-sizing
- The check should include (but not limited to) head track/deflection head, stud position, lintels, framing out, and wall stability

RIBA Stage 4

4
Technical Design

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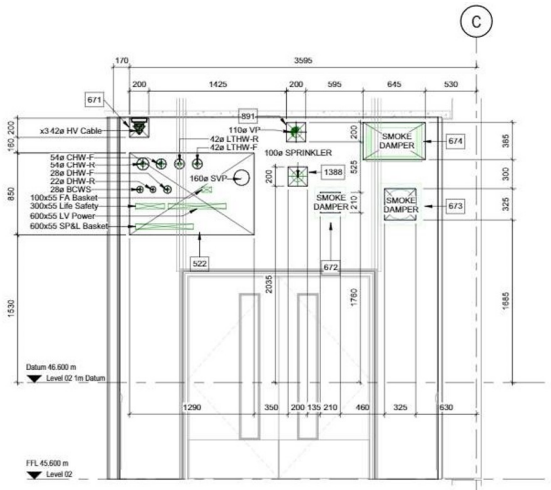

MEP design/model updated to include finalised penetration positions

Architectural design / model

- Once the MEP design has been co-ordinated and includes penetration seal spacing rules, it is essential the architectural design / model is also updated to accommodate additional MEP penetration seal requirements
- Check MEP builders work positions for architectural clashes and advise any penetration repositioning or re-sizing
- The check should include (but not limited to) head track/deflection head, stud position, lintels, framing out, and wall stability
- Once complete, liaise with MEP model owner to ensure any penetration re-sizing or re-positioning is incorporated into MEP model.

RIBA Stage 4

4
Technical Design

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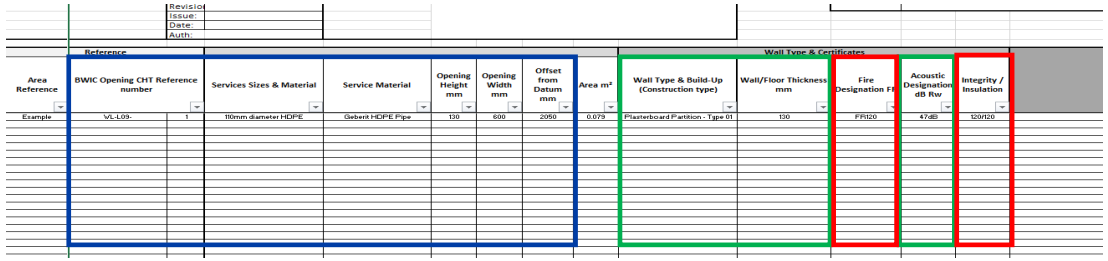
Architectural design / model

- Once multi-disciplinary co-ordination is complete, produce builders work setting out elevation drawings.

- Complete master penetration seal schedule.

Note: Depending on project BIM protocols, it may be possible to automatically extract key MEP, architectural and fire information from the model(s).

- Following this process will make it considerably easier for a suitably qualified and experienced specifier to allocate manufacturer tested or certified penetration seal details to individual builders work penetrations (see next slide).



Area Reference	BWIC Opening CHT Reference number		Services Sizes & Material	Service Material	Opening Height mm	Opening Width mm	Offset from Datum mm	Area m²	Wall Type & Build-Up (Construction type)	Wall/Floor Thickness mm	Fire Designation FI	Acoustic Designation dB Rw	Integrity / Insulation
Example	WL-L09-	1	110mm diameter HDPE	Geberit HDPE Pipe	130	600	2050	0.079	Plasterboard Partition - Type 01	130	FFI120	47dB	120/120

Example of typical penetration seal schedule

RIBA Stage 4

4
Technical Design

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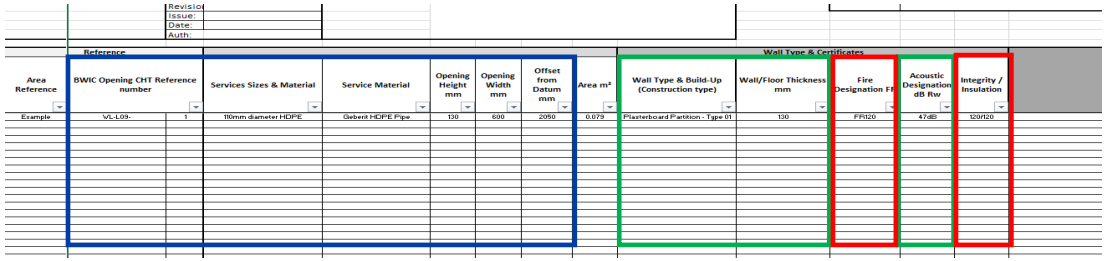

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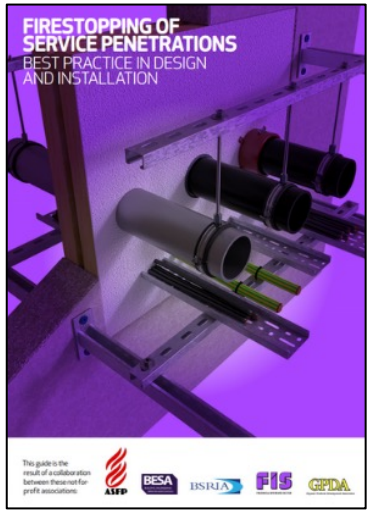
Example	WL-L09-	1	110mm diameter HDPE	Geberit HDPE Pipe	130	600	2050	0.079	Plasterboard Partition - Type 01	130	FFI120	47dB	120/I120

Example of typical penetration seal schedule

Fire stop specifier

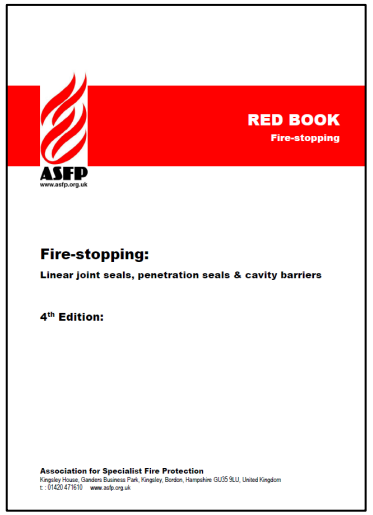
- Penetration seal specifier allocates manufacturer tested or certified penetration seal details to individual apertures along with references to and including supporting information (e.g., ETA documents, classification report etc.)

Further Reading



Fire Stopping of Service Penetrations
Best Practice in Design and Installation

Free Download from ASFP, FIS, BSRIA and BESA



ASFP Red Book (4th Edition)

Fire Stopping:
Linear Joint Seals, penetrations seals & cavity barriers

Available for download from ASFP

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Disclaimer

The Passive Fire Knowledge Group (PFKG) is a not-for-profit collaborative group of specialists working within various fields of passive fire protection.

The aim of the PFKG is to promote passive fire protection guidance and best practice and improve the delivery of well designed, specified and installed passive fire protection.

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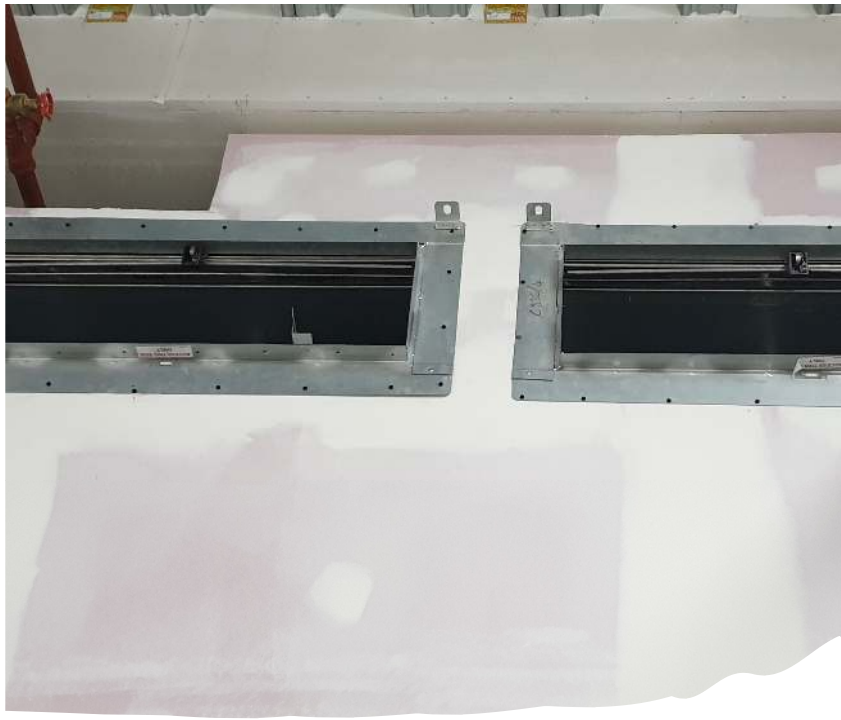
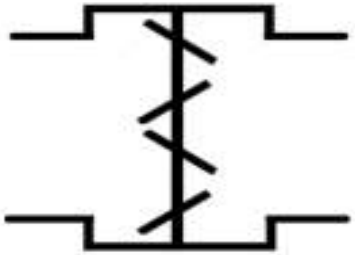


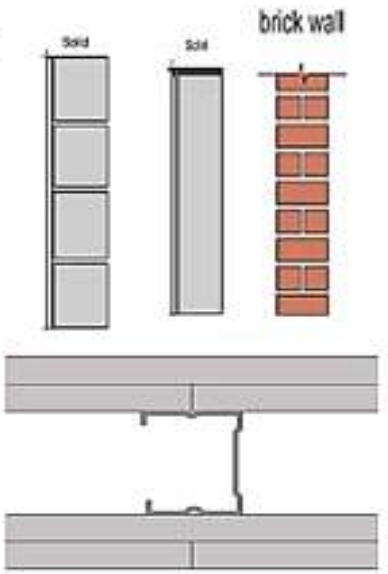
What is the best approach to determining product safety?

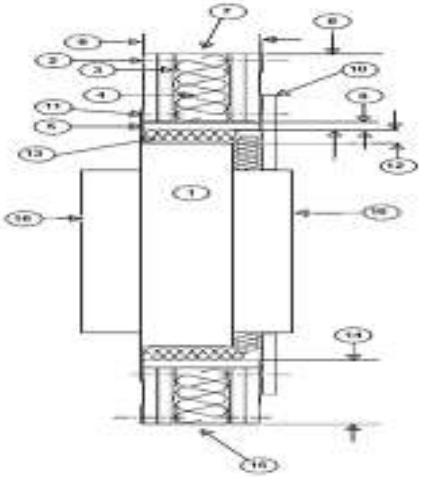
TECHNICAL Quality Assurance. Setting of the appropriate product for the circumstances. Any change is ‘major’ once this has been formulated.

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.

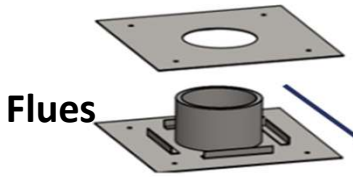
classification for product fire safety type

Supporting construction compatibility type /P.F safety seal type

The installation/ maintenance access types.

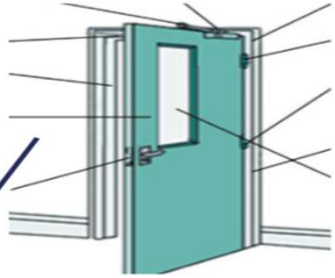
* Culmination of all product types to verify the appropriate wall type.

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



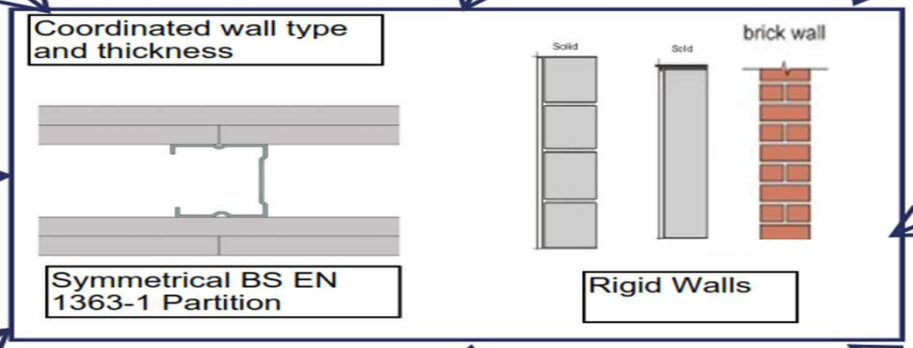
Flues

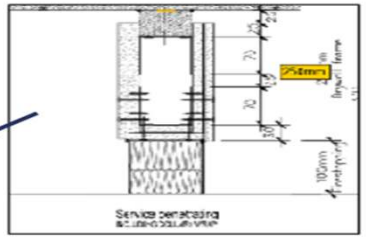
Pipes & Trays



Fire Doors
Lift Doors

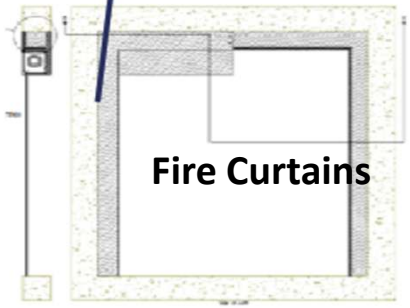
Fire Dampers
Smoke Control Dampers



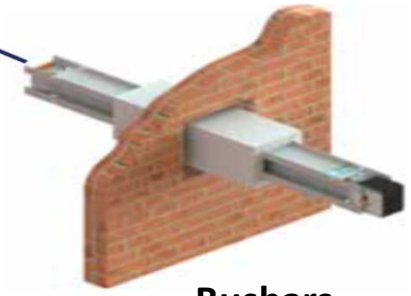


Wall Types

Fire Resistant Ducts
Smoke extract ducts
Cable Encapsulation



Fire Curtains

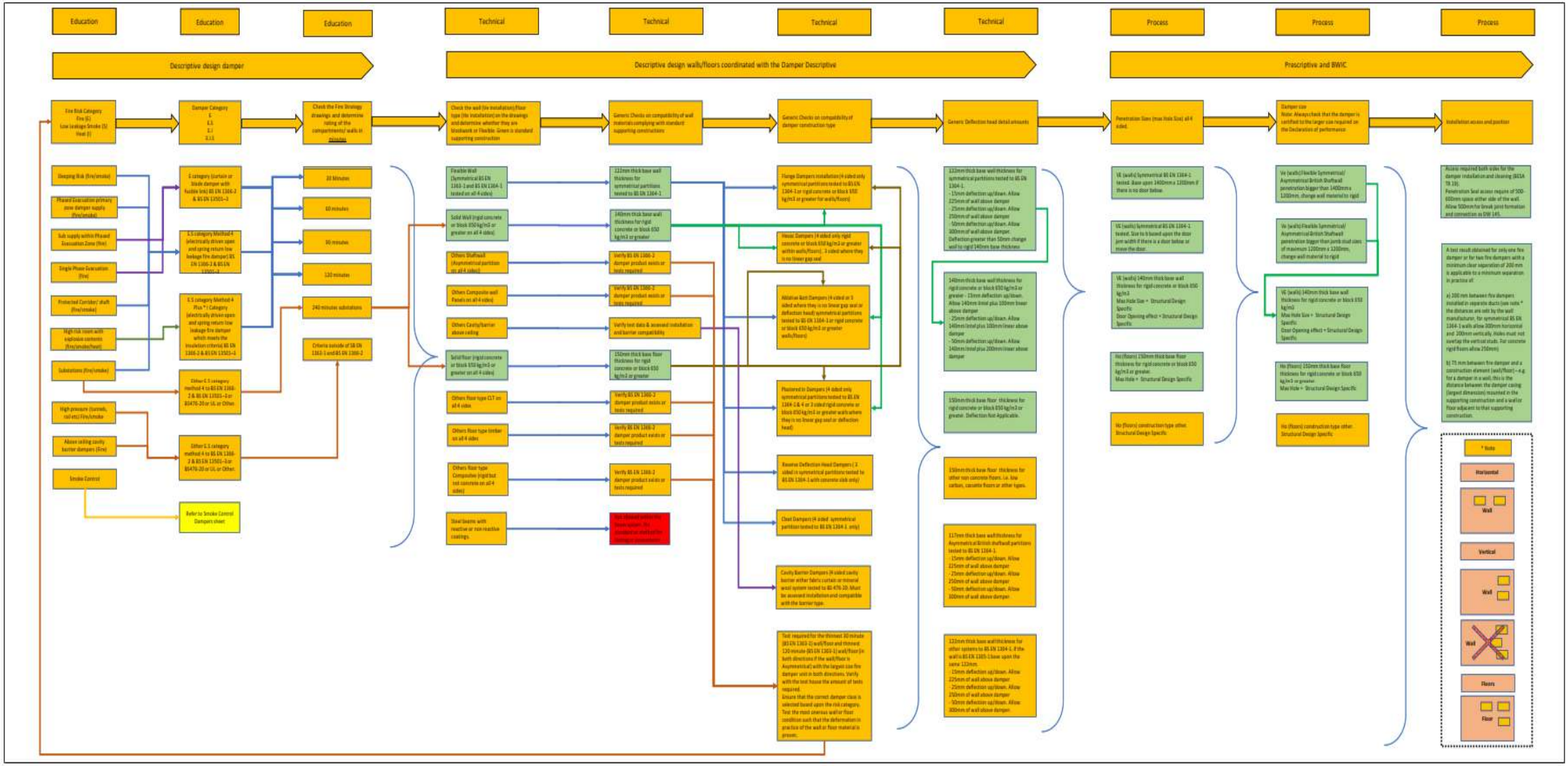


Busbars

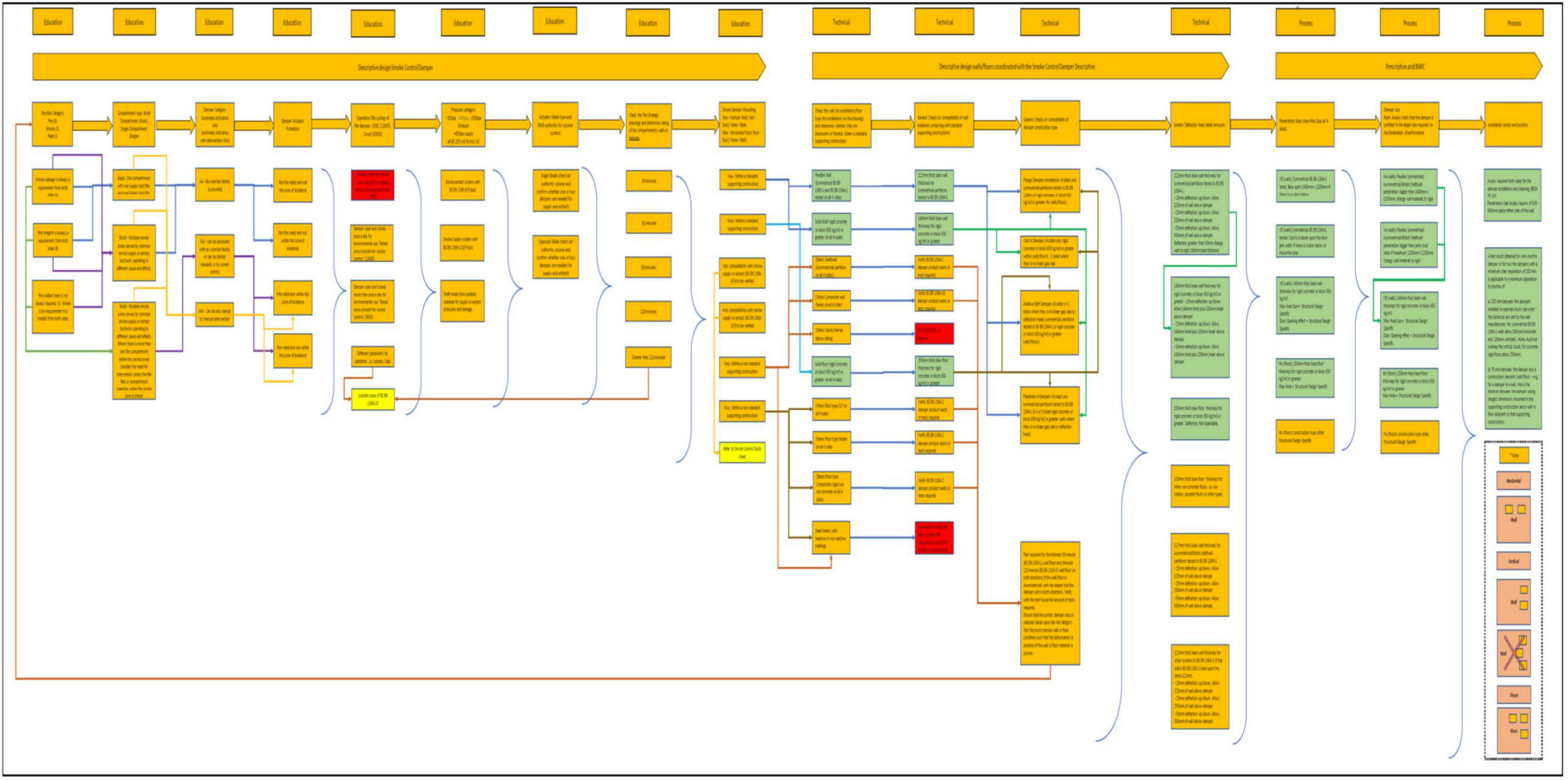
TECHNICAL Quality Control. Workmanship to the QA and site recorded, ‘minor’ maybe a change to the product supplier, not the 5 QA points.

Outputs

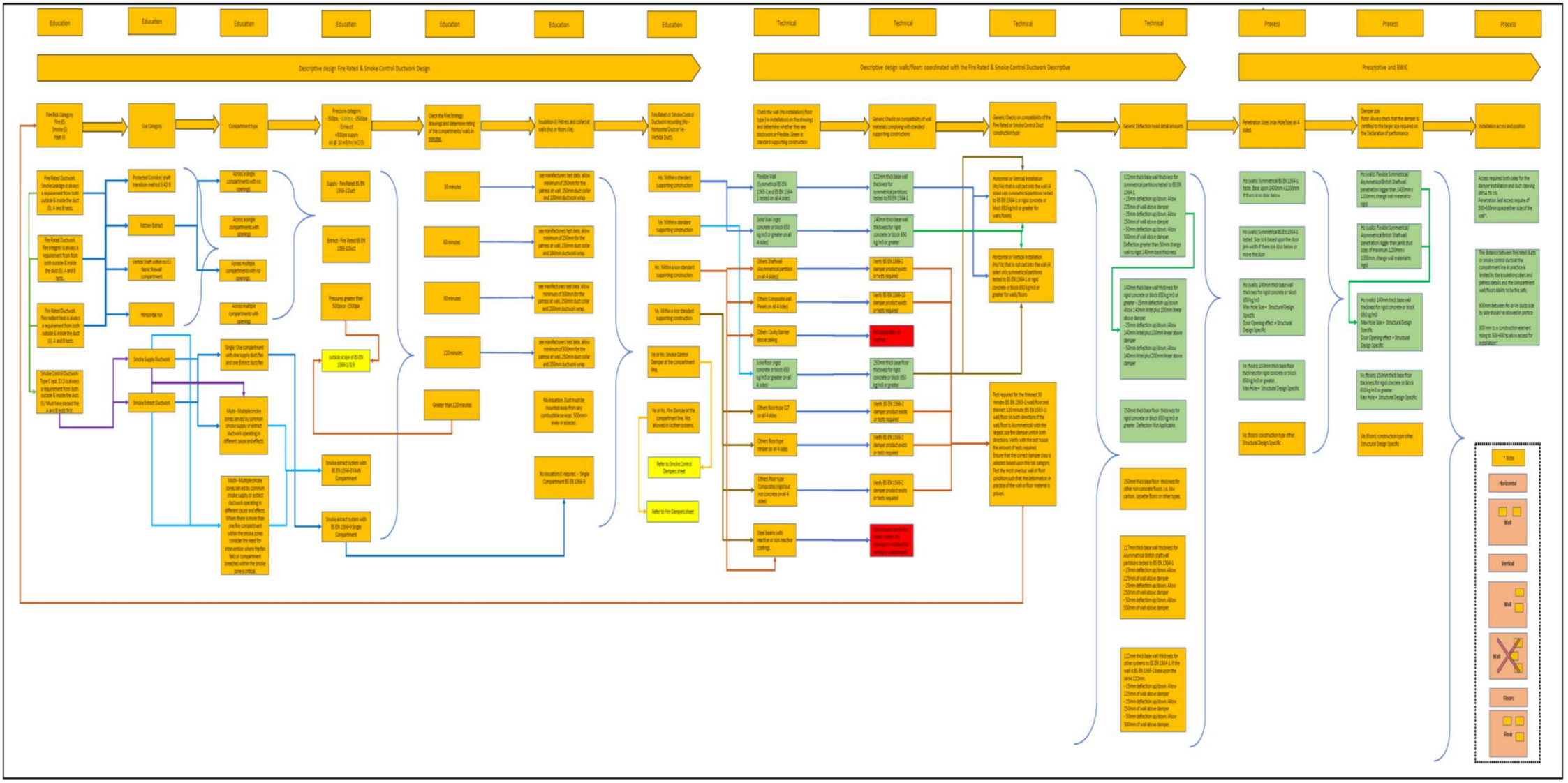
The Process required for descriptive Fire Dampers.



The Process required for descriptive Smoke Control Dampers.



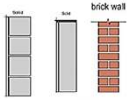
The Process required for descriptive Fire Rated Ductwork and Smoke Control.

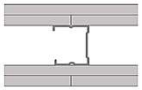


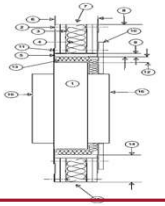
The Process required for descriptive Smoke Control Dampers.

Simplification of the below flow diagram follows.

E.I 120(ho i↔o)S - (1000Pa) MA. Multi







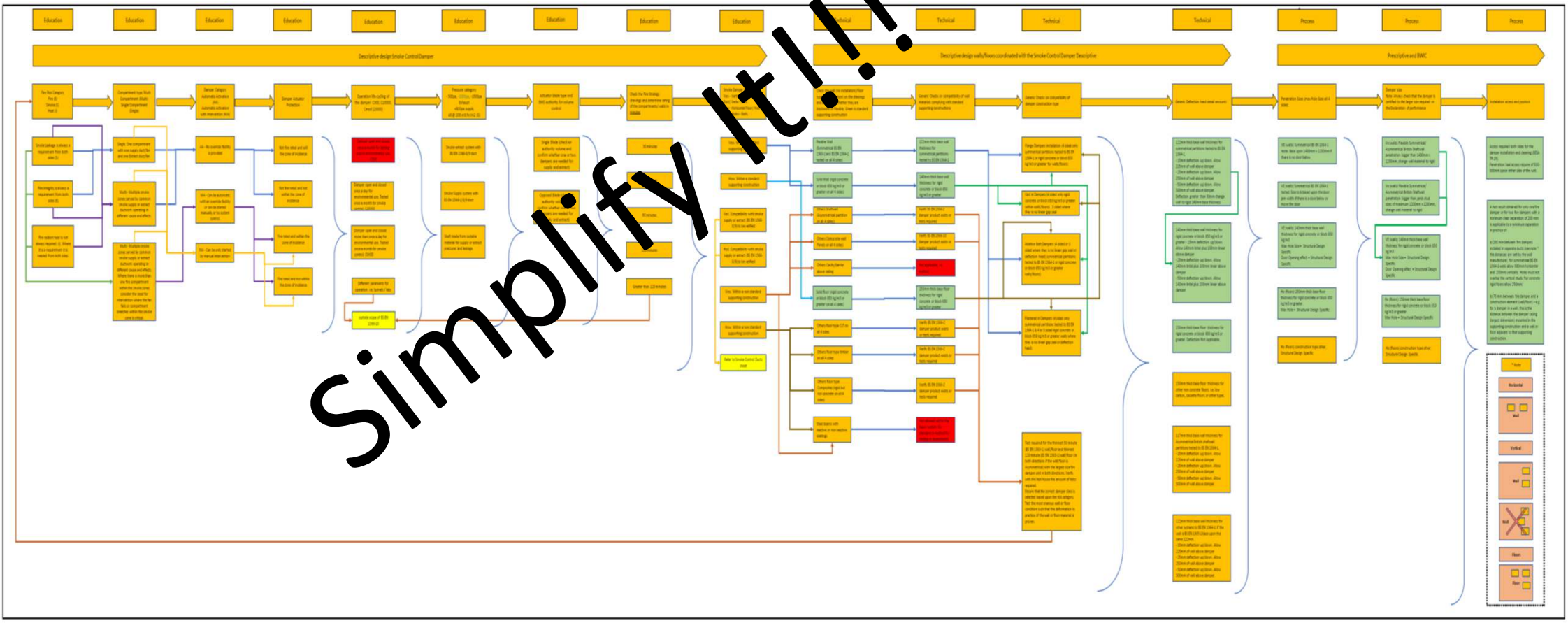
Building purpose group/fire safety space risk

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.



The Process required for descriptive Fire Rated Ductwork and Smoke Control.

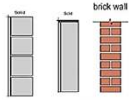
Simplification of the below flow diagram follows.

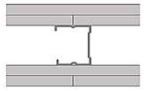
Building purpose group/fire safety space risk

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

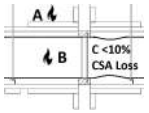
E.I 120(ho i↔o)S - (1000Pa)

classification for product fire safety type

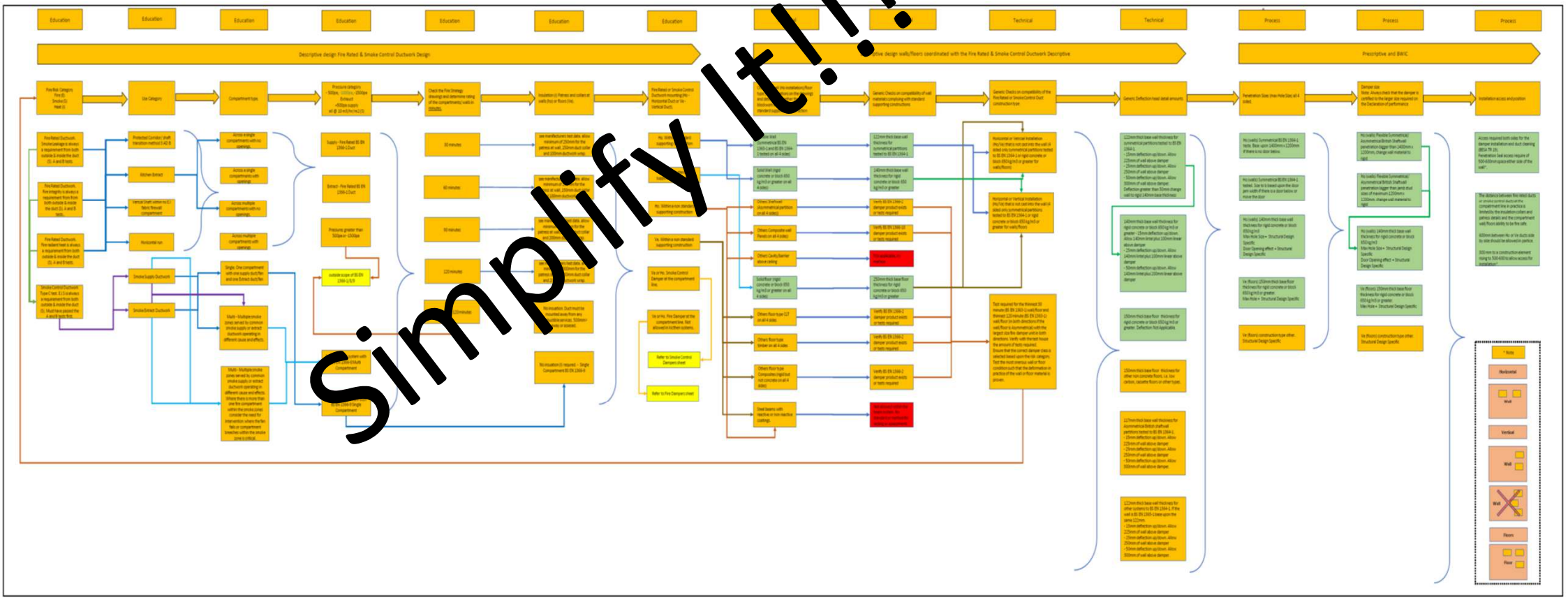




Supporting construction compatibility type /P.F safety seal type



The installation/maintenance access types.



Simplify It!!!

The Process required for descriptive Fire Dampers.

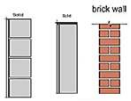
Simplification of the below flow diagram follows.

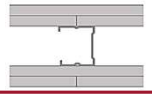
Building purpose group/fire safety space risk

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

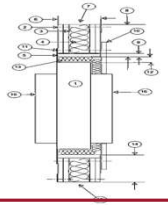
E120(ho i↔o)S - (300Pa)

classification for product fire safety type

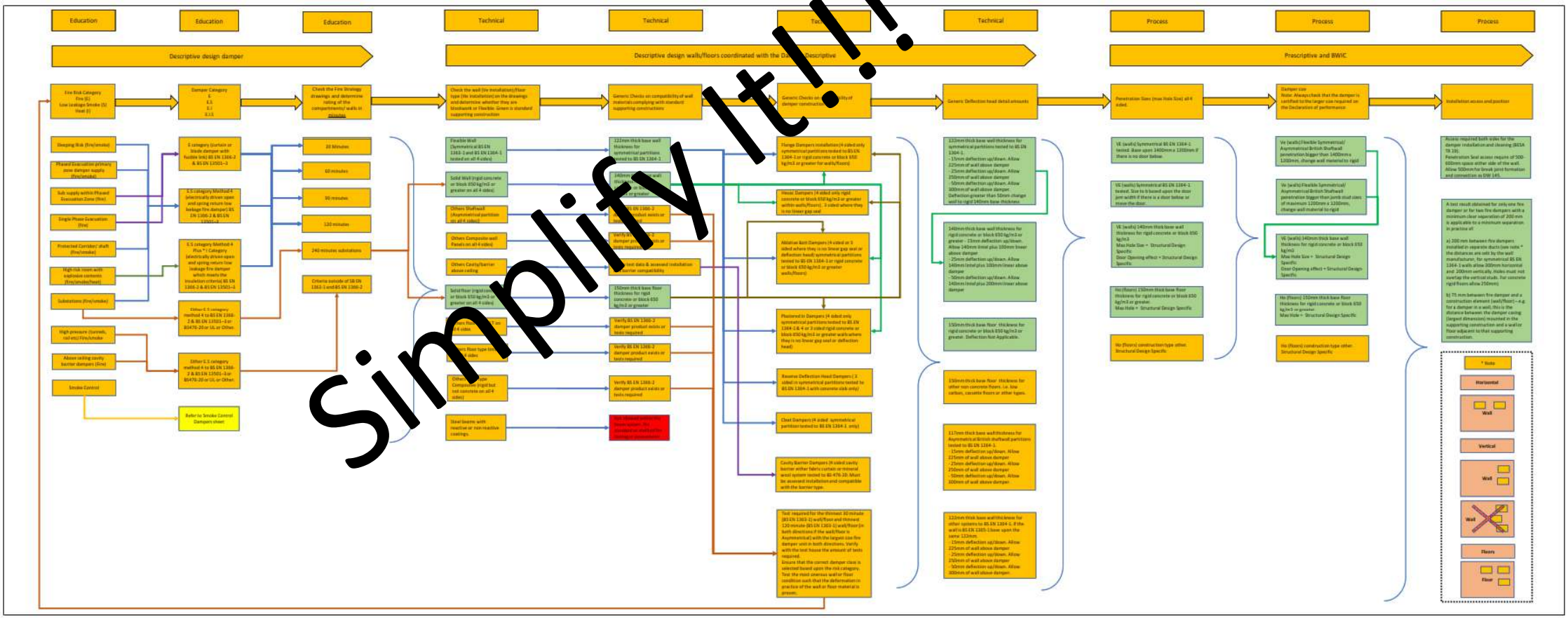




Supporting construction compatibility type /P.F safety seal type



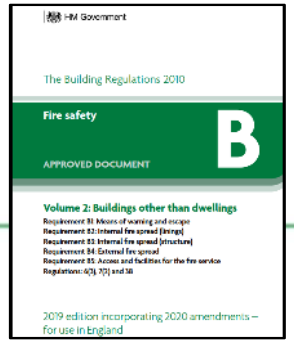
The installation/maintenance access types.



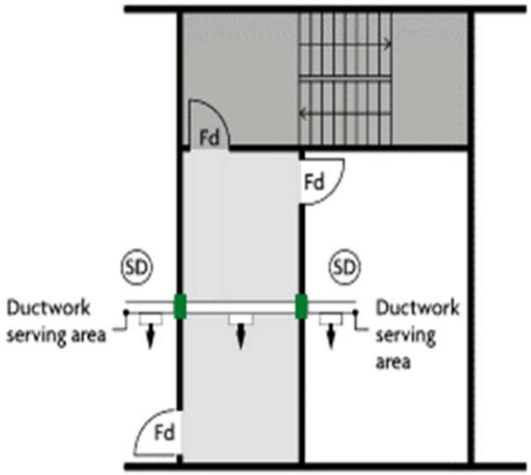
Simplify It!!!

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.

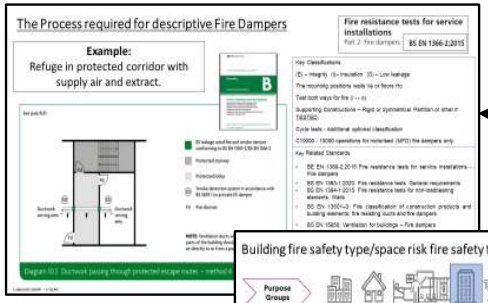
Cycle tests - Additional optional classification

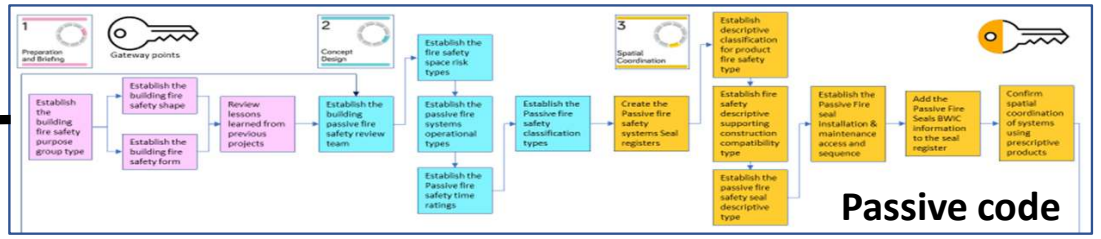
C10000 - 10000 operations for motorised (MFD) fire dampers only.

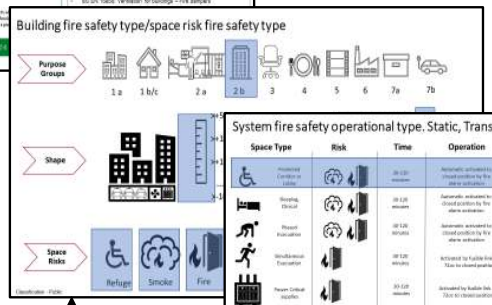
Key Related Standards

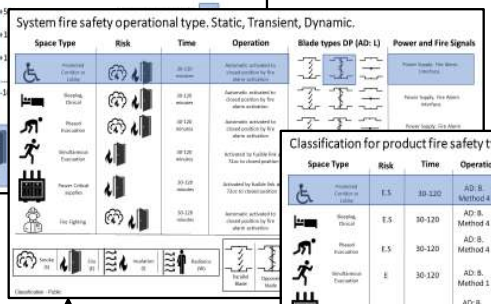
- BE EN 1366-2:2015 Fire resistance tests for service installations - Fire dampers
- BS EN 1363-1:2020. Fire resistance tests. General requirements
- BS EN 1364-1:2015. Fire resistance tests for non-loadbearing elements. Walls
- BS EN 13501–3: Fire classification of construction products and building 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

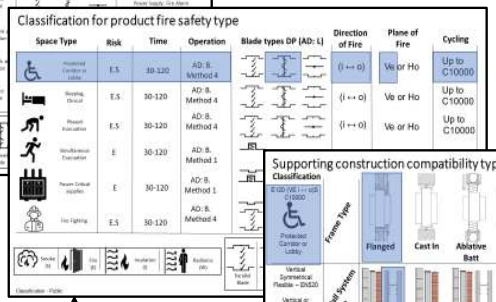
Fire Damper Work Book Example

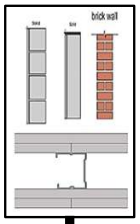


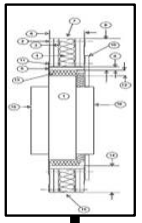


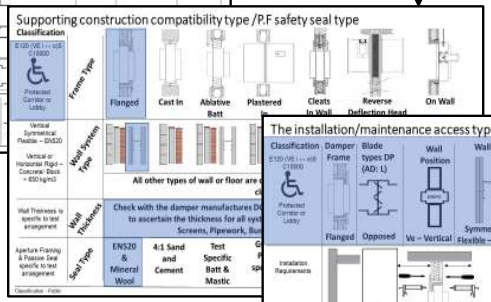


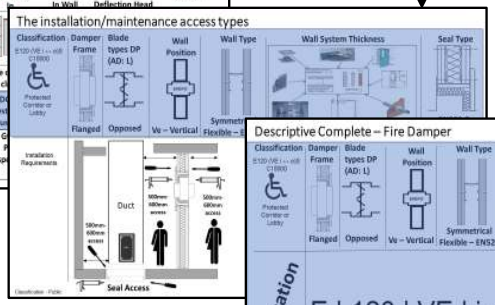


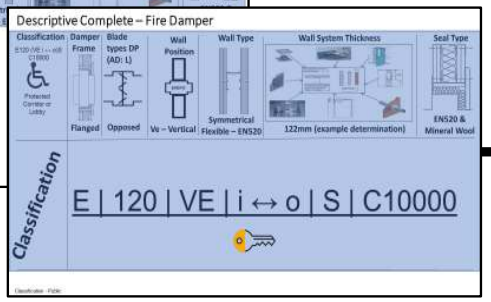


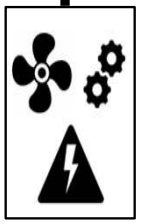


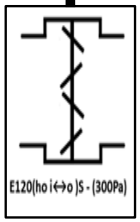


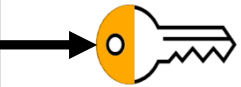




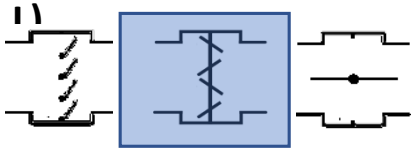
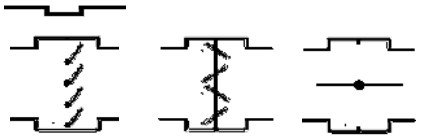


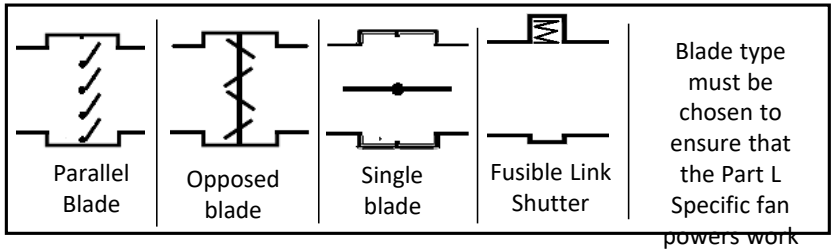


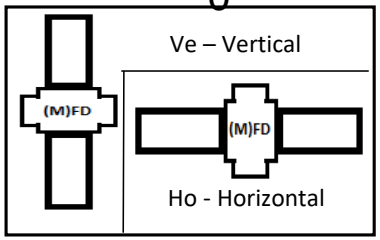




Classification for product fire safety type

Space Type	Risk	Time	Operation	Blade types DP (AD:	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



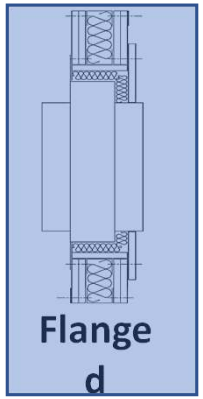
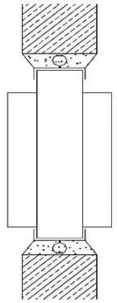
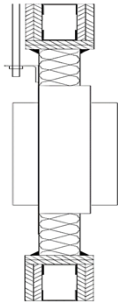
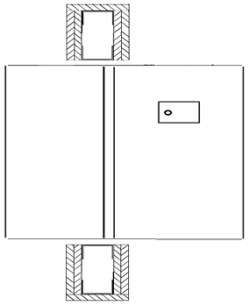
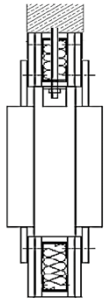
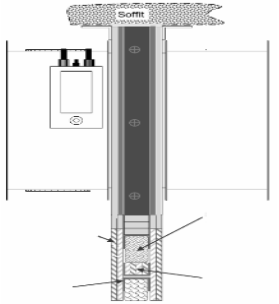
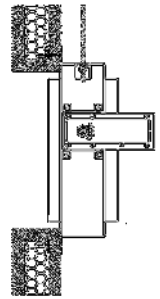
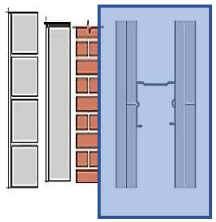
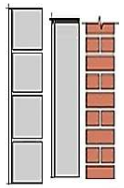
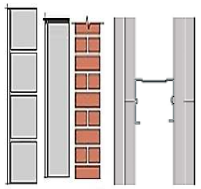
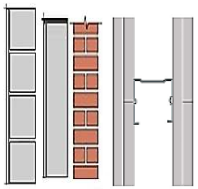
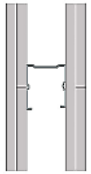
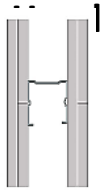
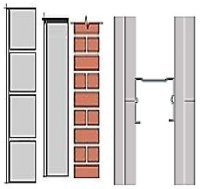


Supporting construction compatibility type /P.F safety seal type

Classification

E120 (VE i ↔ o)S C10000

Protected Corridor or Lobby

Frame Type	 **Flanged**	 **Cast In**	 **Ablative Batt**	 **Plastered In**	 **Cleats In**	 **Reverse Deflection**	 **On Wall**	
Wall System Type								
Wall Thickness	**All other types of wall or floor are classed as "Other" and require supporting test and classification data.**							
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**	

Vertical Symmetrical Flexible – EN520

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

Wall Thickness is specific to test arrangement

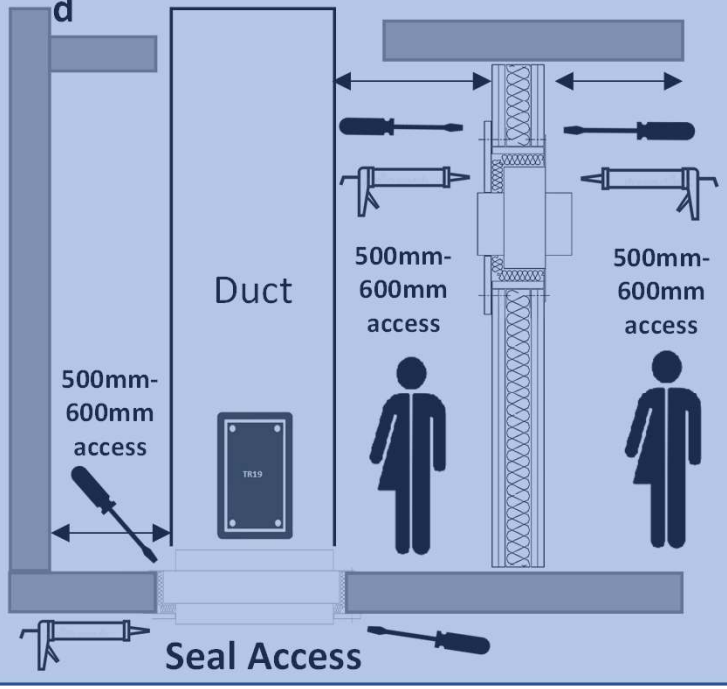
Check with the damper manufactures DOP and compare with other wall system products DOP to ascertain the thickness for all system components (I.E. Doors, FR Ducts, Flues, Glass Screens, Pipework, Busbar, FR Cable Containment Systems)

Aperture Framing & Passive Seal specific to test arrangement

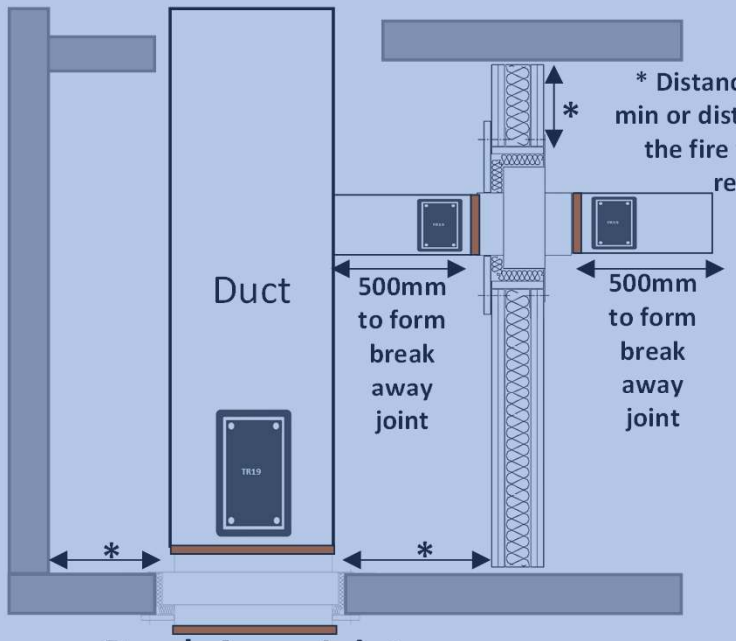
The installation/maintenance access types

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

Installation Requirements



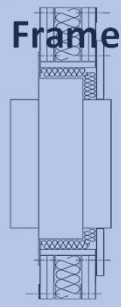
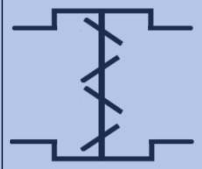
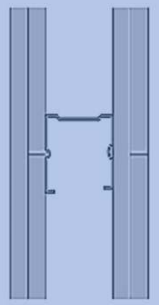
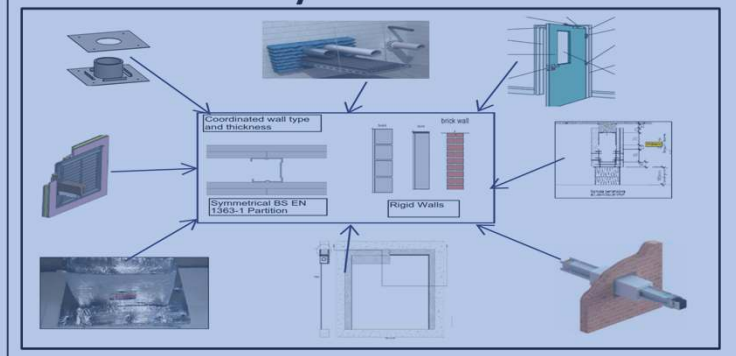
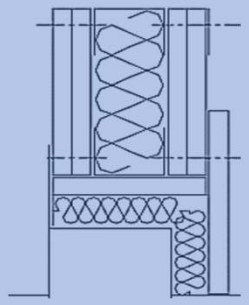
Seal Access



* Distance from slab 75mm min or distance as required by the fire wall for its tested requirements

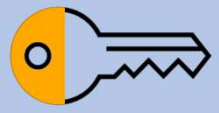
Break Away Joints

Descriptive Complete – Fire Damper

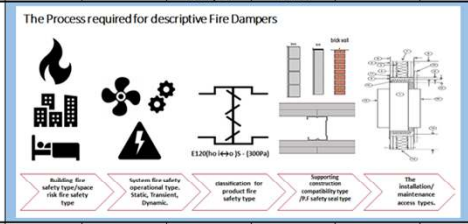
Classification	Damper	Blade types DP (AD: L)	Wall Position	Wall Type	Wall System Thickness	Seal Type
E120 (VE i ↔ o)S C10000  Protected Corridor or Lobby	 Framed Flanged	 Opposed	 Ve – Vertical	 Symmetrical Flexible – EN520	 122mm (example determination)	 EN520 & Mineral Wool

Classification

E | 120 | VE | i ↔ o | S | C10000



Scheduling of products – Fire Dampers

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	Installation method	Bespoke	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)	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