

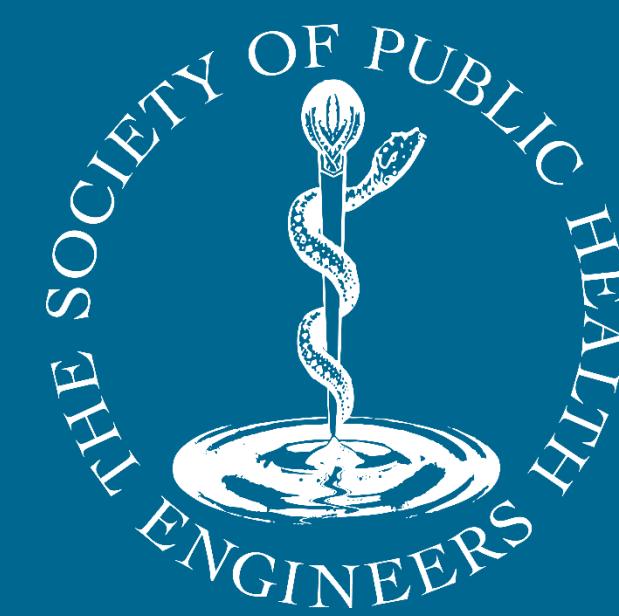
Practical application of compartmentation in building projects for fire and public health systems

Contractors Session 4

Paul McSoley | Mace Group

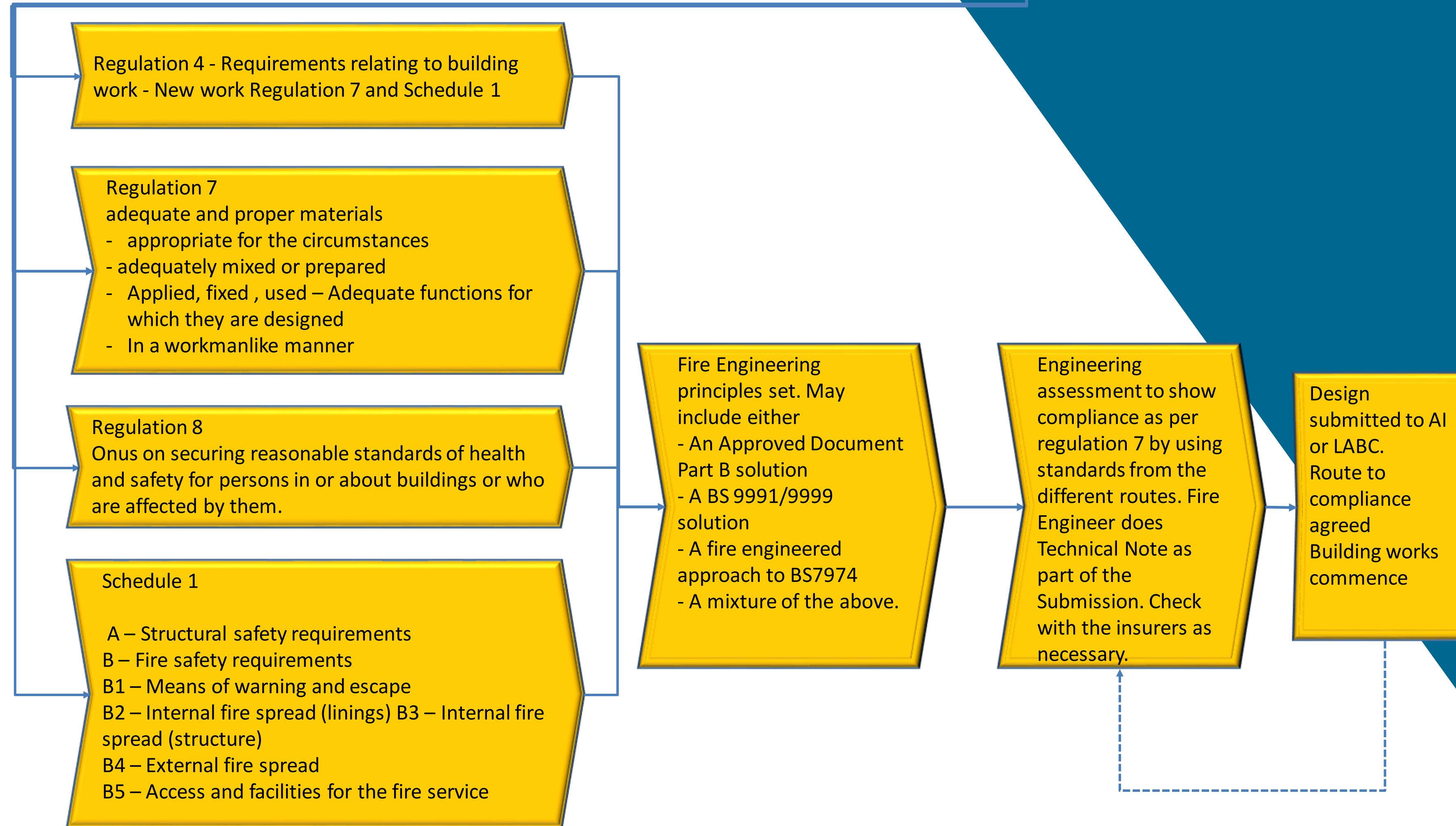
Nigel Green | Higgins Partnerships

Drew Mclean | London Diamond Drilling Construction



Building work must be undertaken in accordance with The Building Regulations 2010

Regulation 4
Regulation 7
Regulation 8
Schedule 1



New Methods

Fire resistance tests for service installations

- EN 1363-1: General requirements (tests)
- EN 1366-1: Fire Ducts
- EN 1366-2: Fire dampers
- EN 1366-3: Penetration seals
- EN 1366-4: Linear joint seals
- EN 1366-5: Service ducts and shafts
- EN 1366-6: Raised access floors and hollow floors
- EN 1366-8: Smoke extraction ducts
- EN 1366-9: Smoke extraction ducts single compartment
- EN 1366-11: Fire Cable Systems and Components
- EN 1366-10: Smoke control dampers
- EN 1366-13: Chimneys
- EN 1364-1: Fire resistance tests for nonloadbearing
- EN 81-58: Landing doors fire resistance test
- Elements
- EN 1364-2: Ceilings
- EN 1364-4: Curtain walling

Old Methods

Fire Resistance Tests on Building Materials and Structures

- BS 476-20 : Elements of Construction (General Principles)
- BS 476-21 : Load bearing Elements of Construction
- BS 476-22 : Non-Load bearing Elements of Construction
- Tests are an 'Ad Hoc' Standard –Penetration Seals
- BS 476-23 : Contribution of Components to the Fire Resistance of a Structure
- BS 476-24 : Fire Resistance of Ventilation Ducts

Fire Stopping? This is a word that is generalised for sealing holes in walls and needs to be removed from the language. Its penetrations seals specific to the componentry.

- It is important to understand that CE marking is not a quality mark. It is a manufacturer's claim that the product has undergone testing to procedures set out in the EN product standard or ETAG.
- CE Marking indicates that the manufacturer has met the legal requirements under European Directives (CPR) and represent the manufacturer's claim that the test requirements of all relevant European Directives have been satisfied for the purpose to which the product is being used.

It does not mean its appropriate for use in the wrong application.

Wall Types, Standard Supporting Constructions

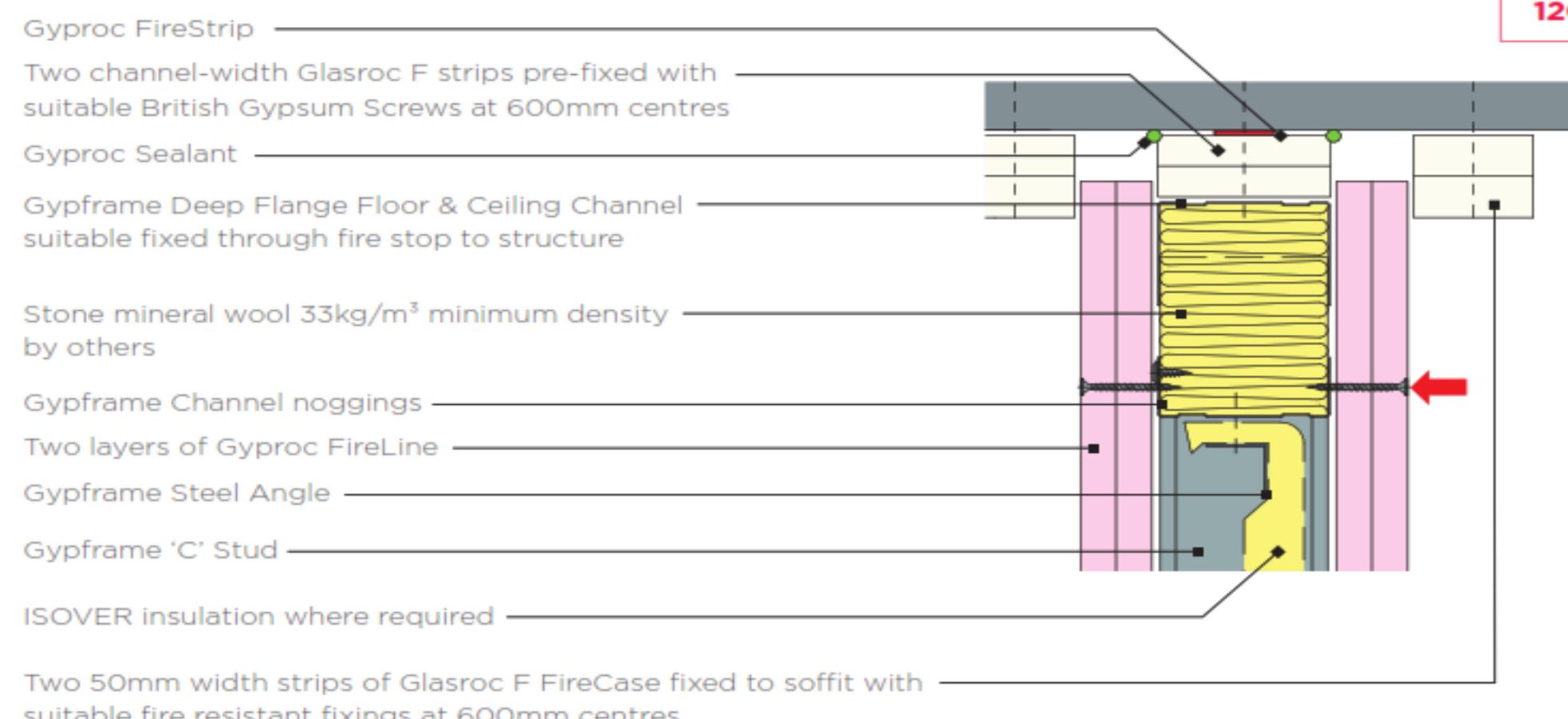
BS EN 1366-X gives advice on the supporting constructions. The references always lead back to what has been tested via the test methods in BS EN 1363-1.

Where property systems are test in flexible walls they are grouped as below.

Nominal Steel Stud Depth		EN 520 Board	EN 520 Board	1363 Other Tested Systems			
1363 Group A	1363 Group B	1363 Group C	Layers per side	Thickness mm	Stud Thickness	Layers per side	Thickness mm
EI30	44 to 55mm	56 to 75mm	76 to 100mm	1 Layer	12.5mm	Check Manu	Check Manu
EI60	44 to 55mm	56 to 75mm	76 to 100mm	2 Layer	12.5mm	Check Manu	Check Manu
EI90	44 to 55mm	56 to 75mm	76 to 100mm	2 Layer	12.5mm	Check Manu	Check Manu
EI120	62 to 70mm	71 to 75mm	76 to 100mm	2 Layer	15mm	Check Manu	Check Manu

15. Deflection head

25mm downward movement and 120mins fire resistance to BS EN 1364-1



The trick with flexible constructions is selecting a wall type that is appropriate for the fire stopping methods or for the damper or ductwork installation methods etc. Most used 50mm stud and 2x 12.5mm EN520 to both sides.

Wall Types, Standard Supporting Constructions

BS EN 1366-X gives advice on the supporting constructions. The references always lead back to what has been tested via the test methods in BS EN 1363-1.

High density rigid construction

This kind of construction consists either of blockwork, masonry or homogenous concrete wall with an overall density $\geq 850 \text{ kg/m}^3$ and a thickness appropriate for the expected fire resistance period.

Low density rigid construction

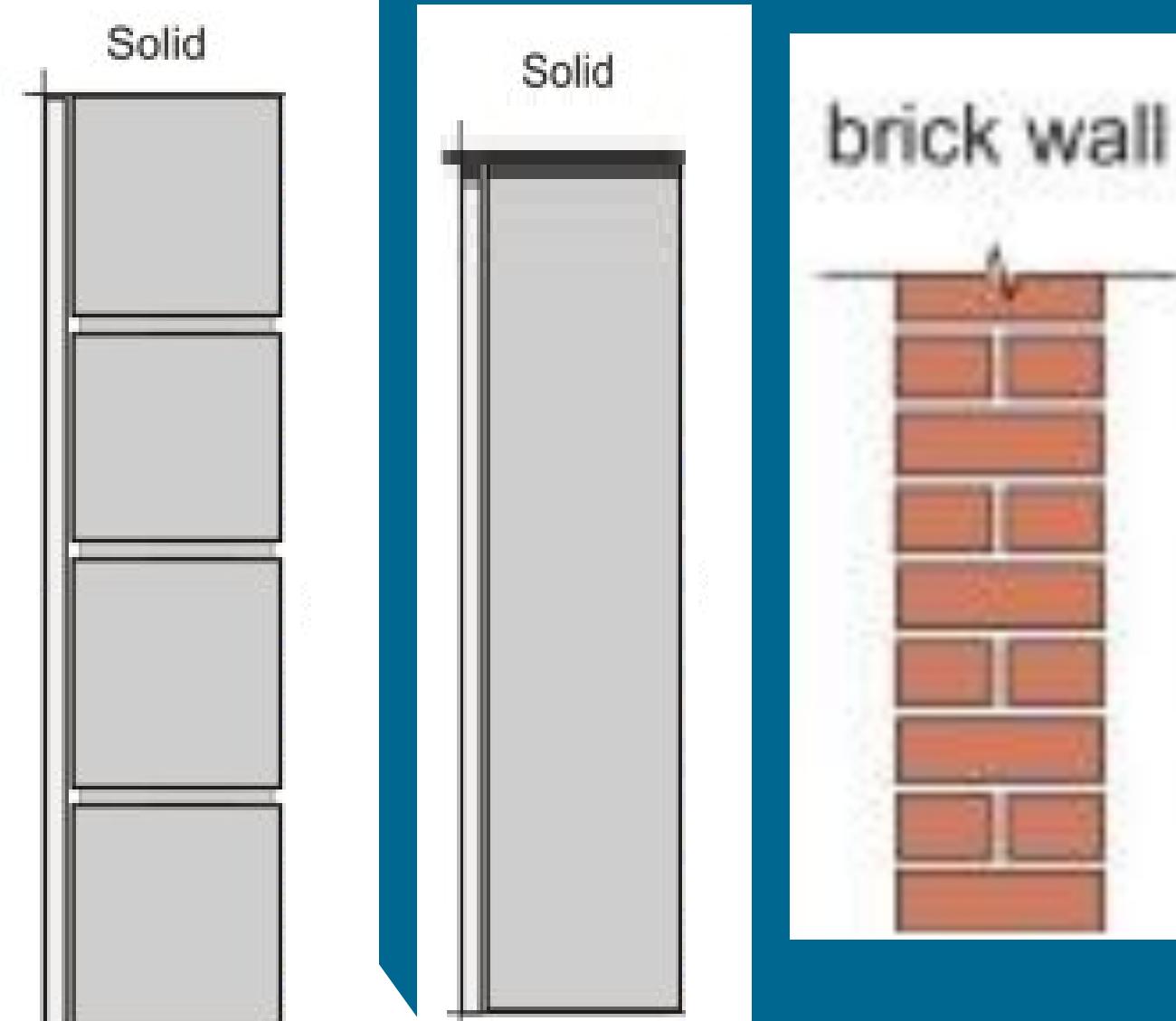
This kind of construction consists of an aerated concrete block wall with an overall density of $(650 \pm 200) \text{ kg/m}^3$ and a thickness appropriate for the expected fire resistance period.

Mortar

For blockwork (incorporating aerated concrete) or masonry wall supporting constructions given in above, the individual masonry units shall be bonded together with a mortar appropriate for the expected fire resistance period.

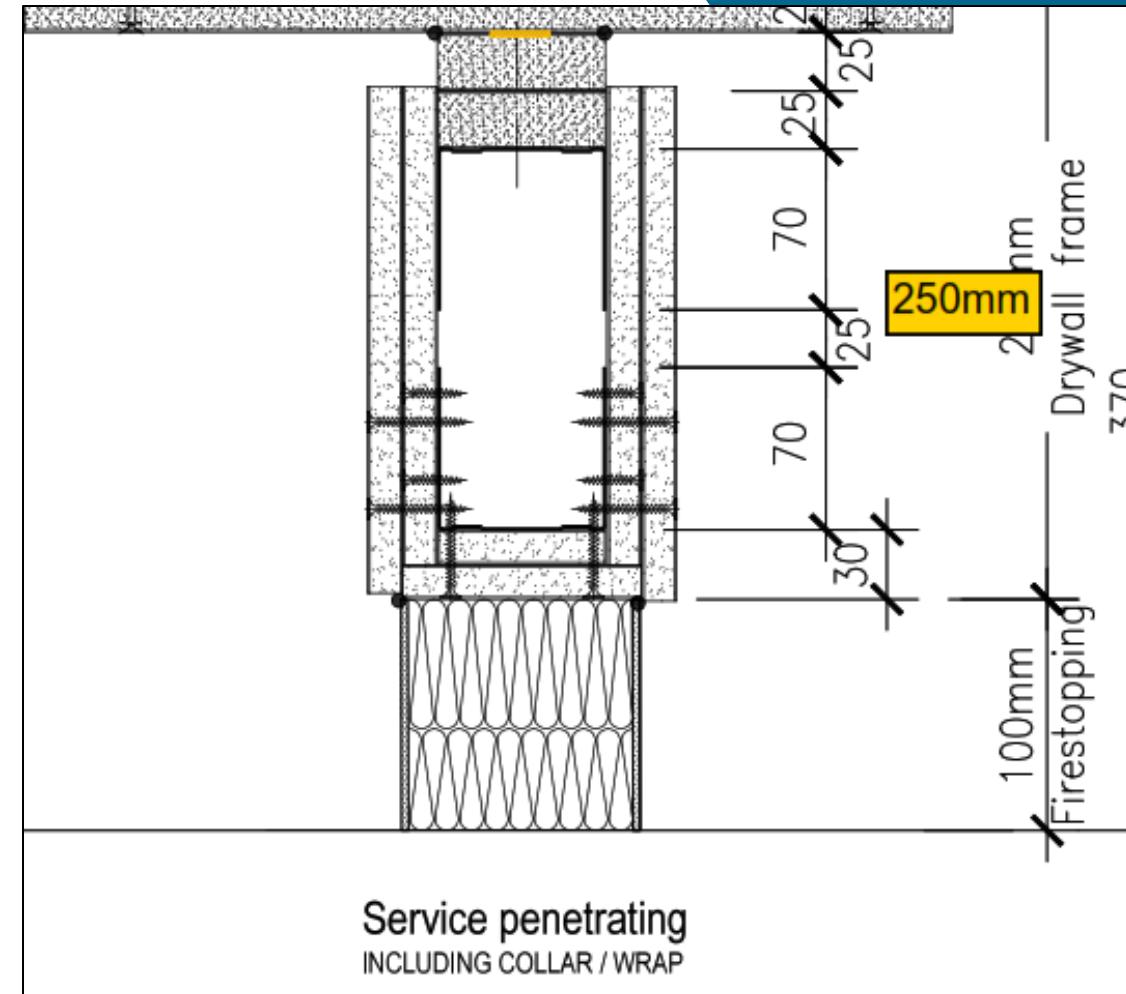
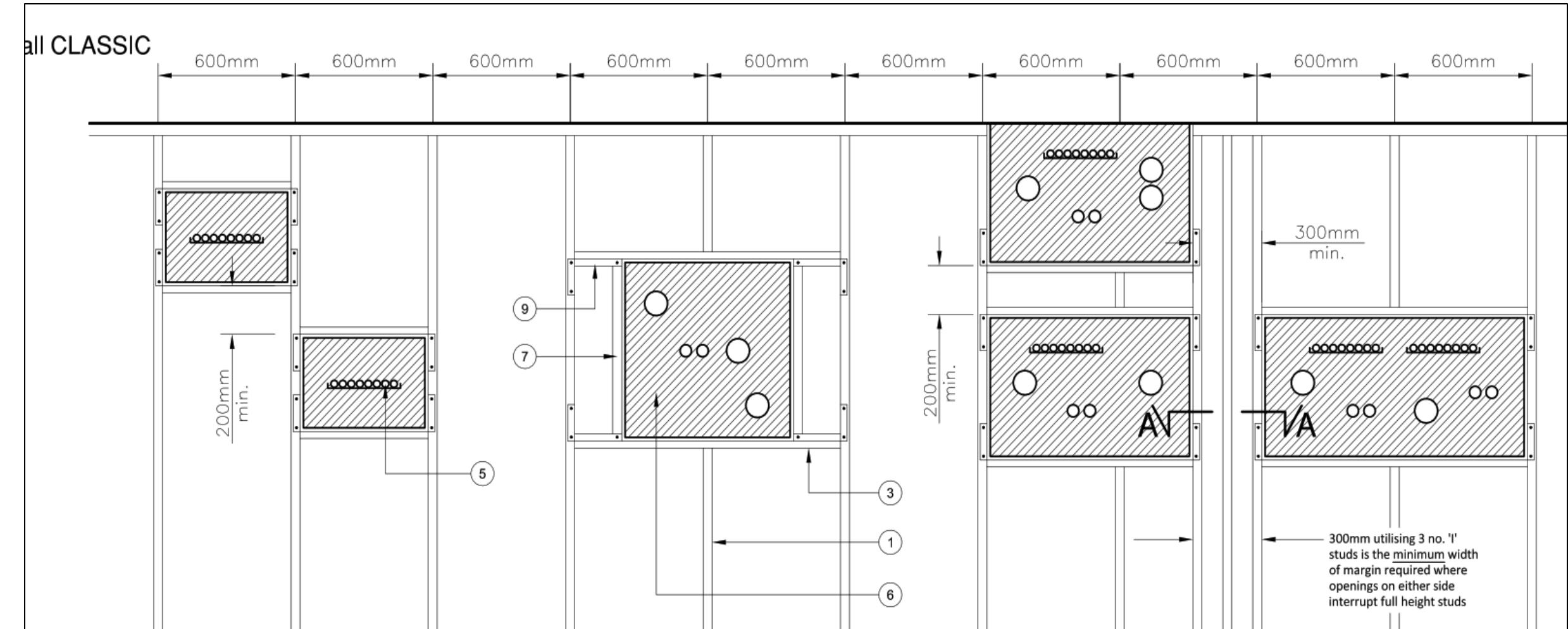
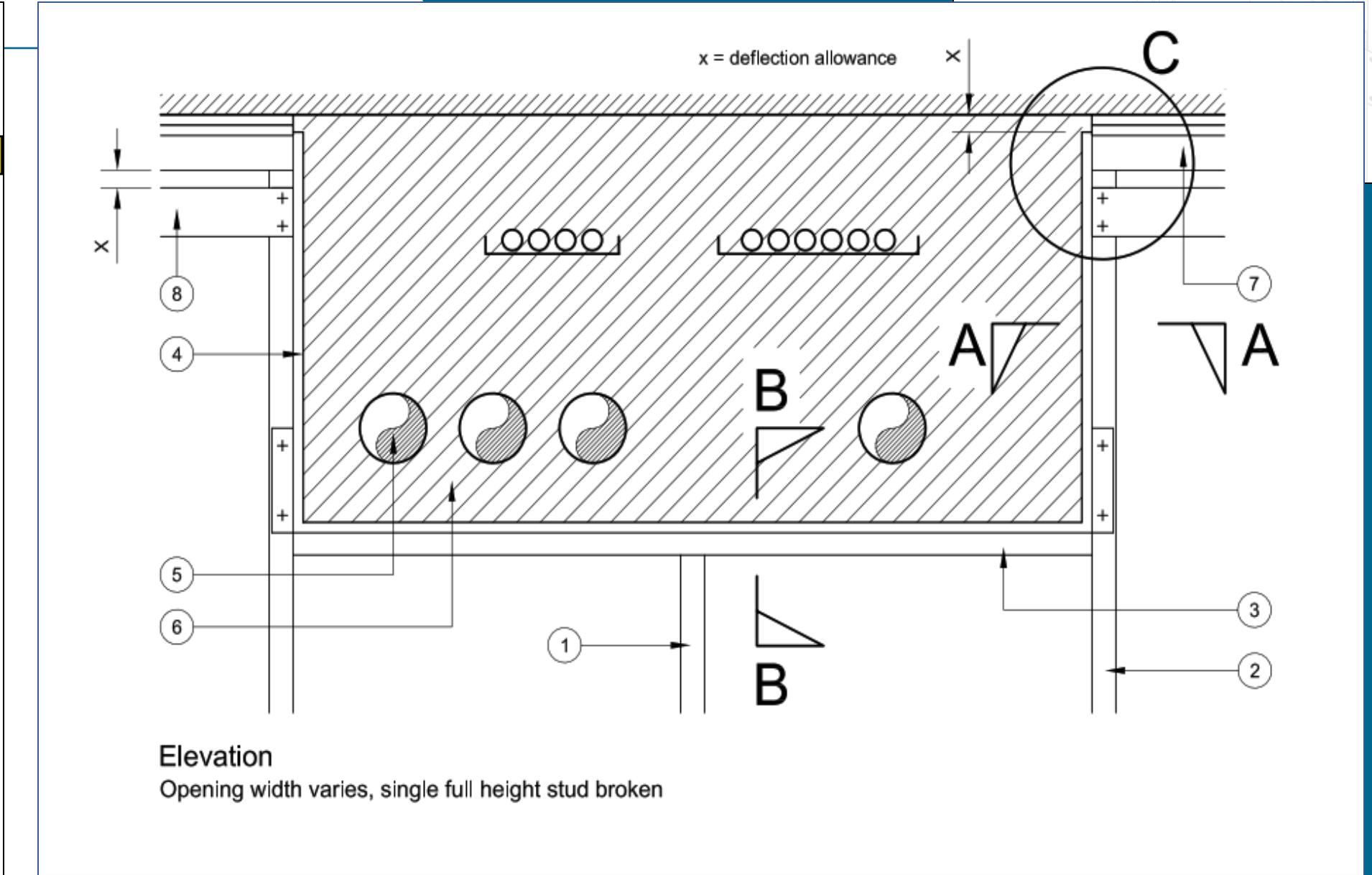
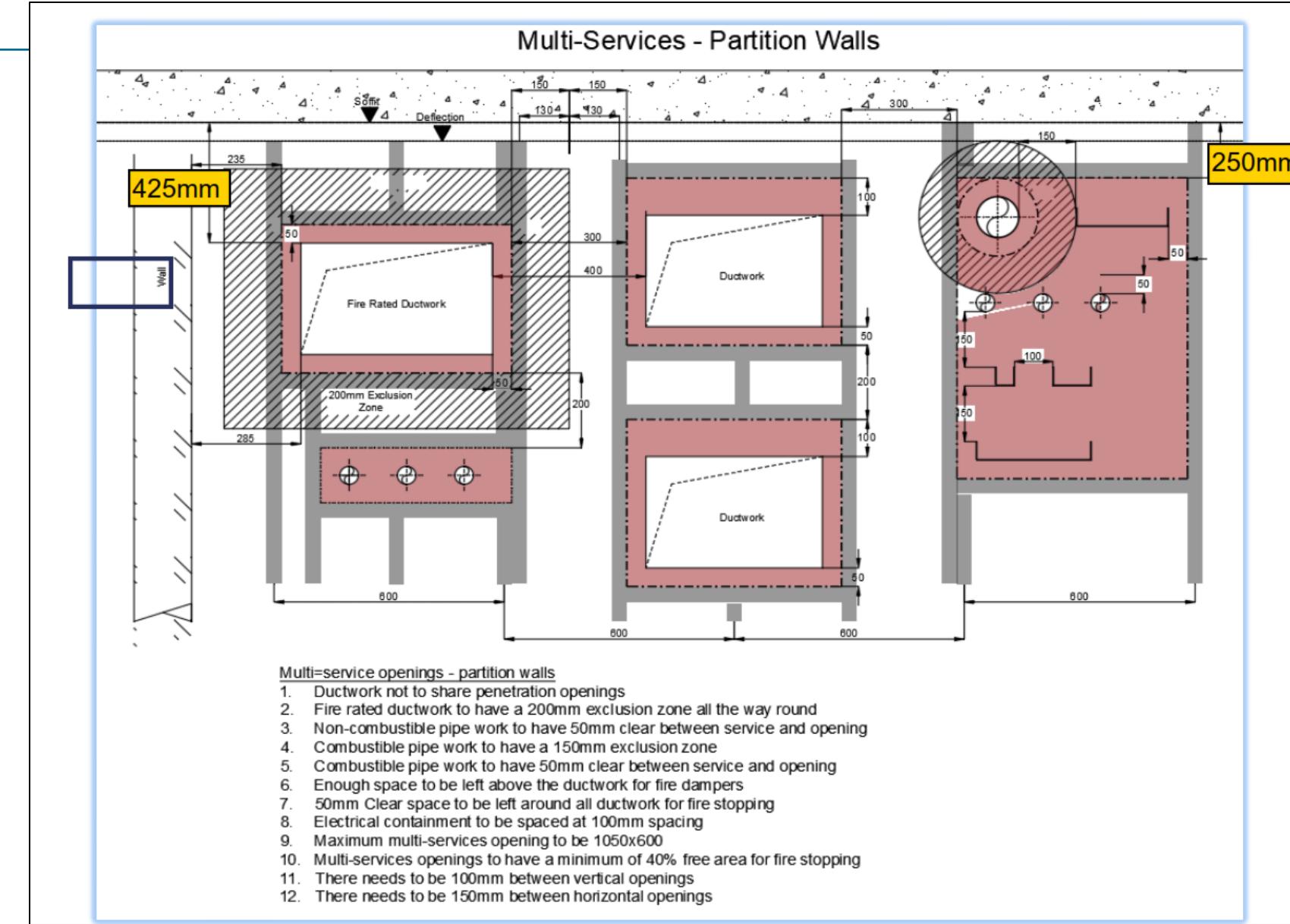
Non Standard Supporting Constructions

When the test specimen is intended to be used in a form of construction not covered by a standard supporting construction, it shall be tested within the supporting construction in which it is intended to be used.



Wall Types, Standard Supporting Constructions

- Deflection is picked up by the walls and not the services.



Other field issues

Beam Types and Standard Supporting Constructions

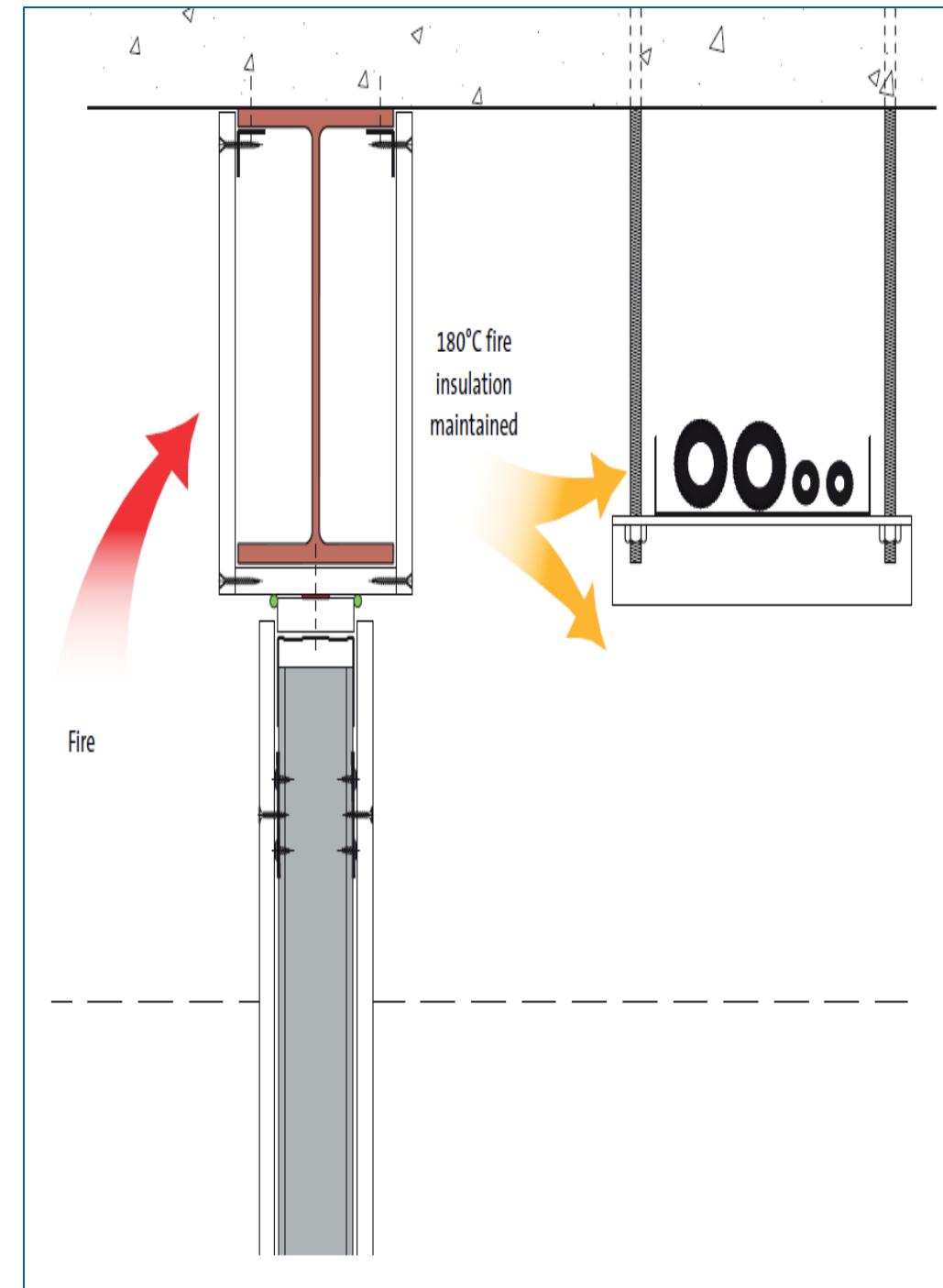


Table 1 — Standard floor constructions

Type of construction	Thickness mm	Density kg/m ³	Test duration <i>t</i> h
Normal concrete	110 ± 10	2 200 ± 200	<i>t</i> ≤ 1,5
	150 ± 10	2 200 ± 200	1,5 < <i>t</i> ≤ 3
	175 ± 10	2 200 ± 200	3 < <i>t</i> ≤ 4
Aerated concrete	125 ± 10	650 ± 200	<i>t</i> ≤ 2
	150 ± 10	650 ± 200	2 < <i>t</i> ≤ 4

7.3 Minimum separation

If more than one damper is tested at the same time the distance between the fire dampers shall not normally be less than 200 mm, as shown in Figures 11 and 12. However, if a specific installation requires fire dampers to be closer, then they shall be tested to the minimum separation used in practice.

A test result obtained for a fire damper installed within a structural opening is only applicable to fire dampers of the same type installed in the same orientation and position in relation to the supporting construction as that tested.

A test result obtained with the duct passing through a standard supporting construction is applicable to a supporting construction with a fire resistance equal to or greater than that of the standard supporting construction used for the test (thicker, denser, more layers of board, as appropriate).

Test results obtained with duct passing through flexible vertical supporting constructions may be applied to rigid supporting constructions of a thickness equal to or greater than that of the element used in the tests, provided that the classified fire resistance of the rigid supporting construction is greater than or equal to the one used for the test.

EN 13381-4 (non-reactive products) and EN 13381-8 (reactive products).

Services should not be installed through steel beams at compartment lines. There is no test evidence for any nor any test methods.

Beam Types and Standard Supporting Constructions



EN 13381-4 (non-reactive products) and EN 13381-8 (reactive products).

Fire resistance tests for service installations

Part 3: Penetration seals

BS EN 1366-3

Covers

- Metallic Pipes
- Plastic Pipes
- Metallic Tray work
- Metallic Ladders
- Conduits
- Trunking
- Busbar

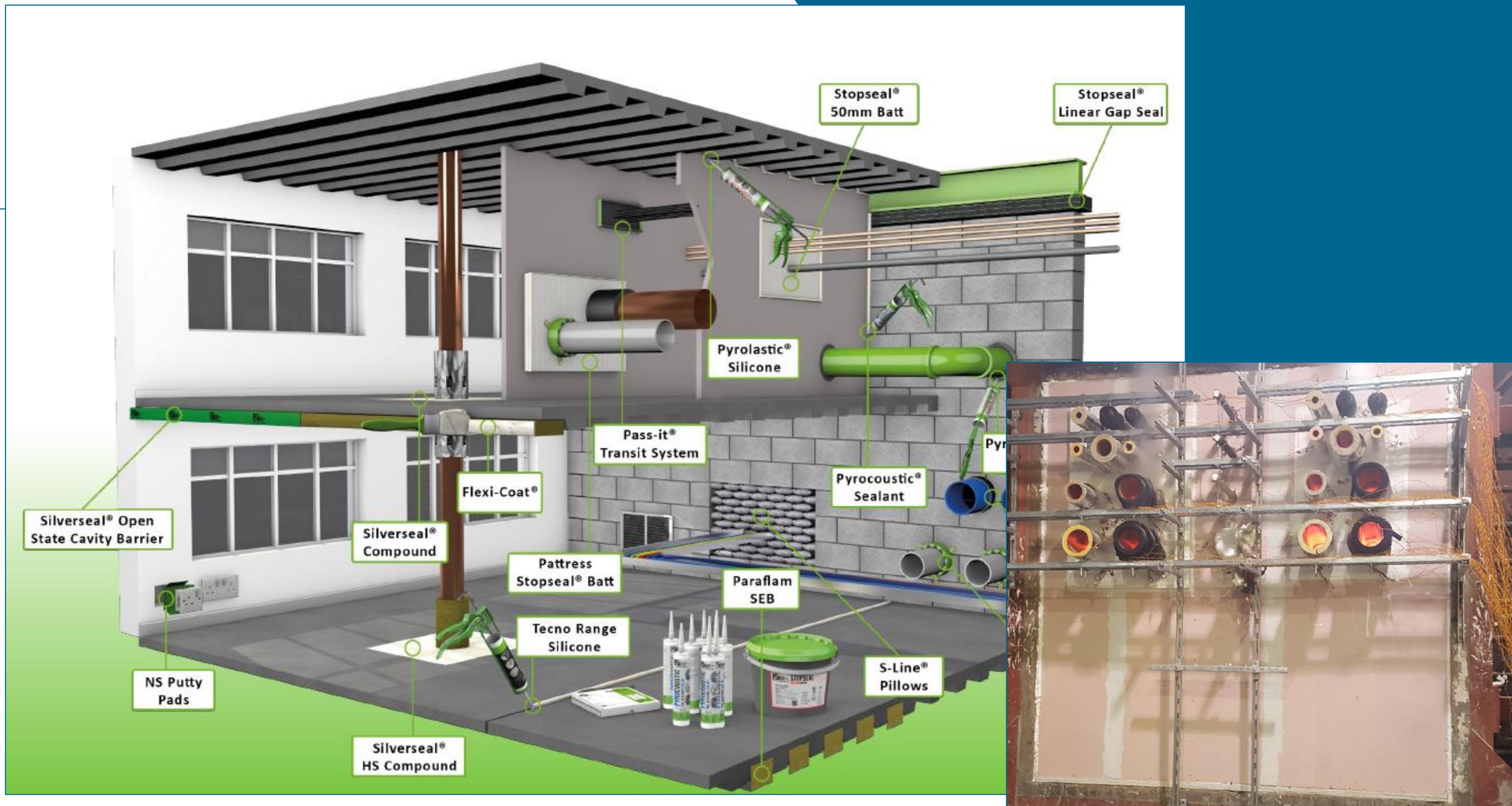
There are different fields for busbar, trunking and conduits

Key Classifications

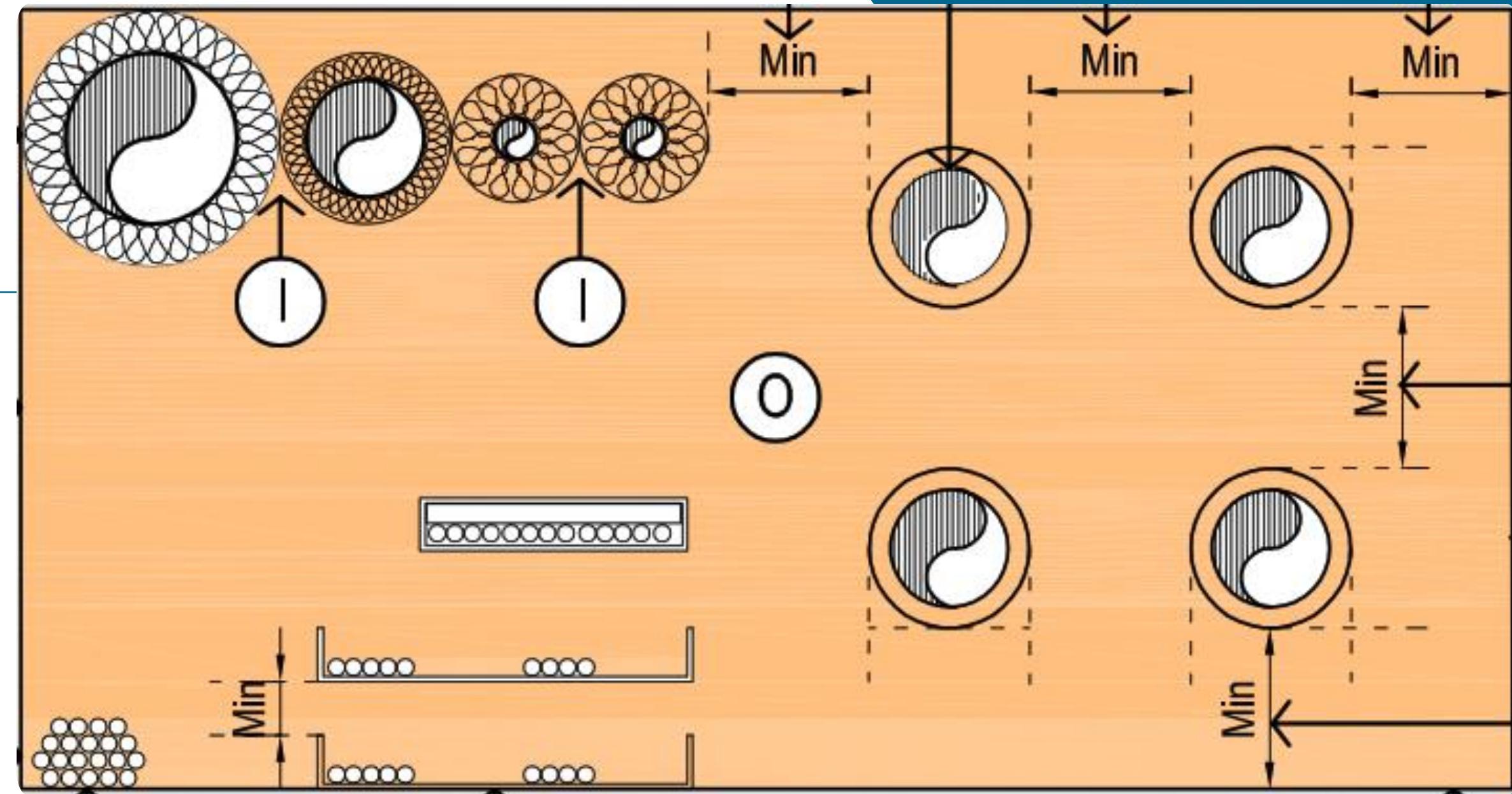
- (E) – Integrity ADD CS, CL, U/C ETC
- (I) – Insulation

Key Related Standards

- BS EN 1366-3:2021. Fire resistance tests for service installations. Penetration seals
- 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 13501-1:2018. Fire classification of construction products and building elements. Classification using data from reaction to fire tests
- BS EN 15882-3:2009. Extended applications of results from fire resistance tests for service installations. Penetration seals



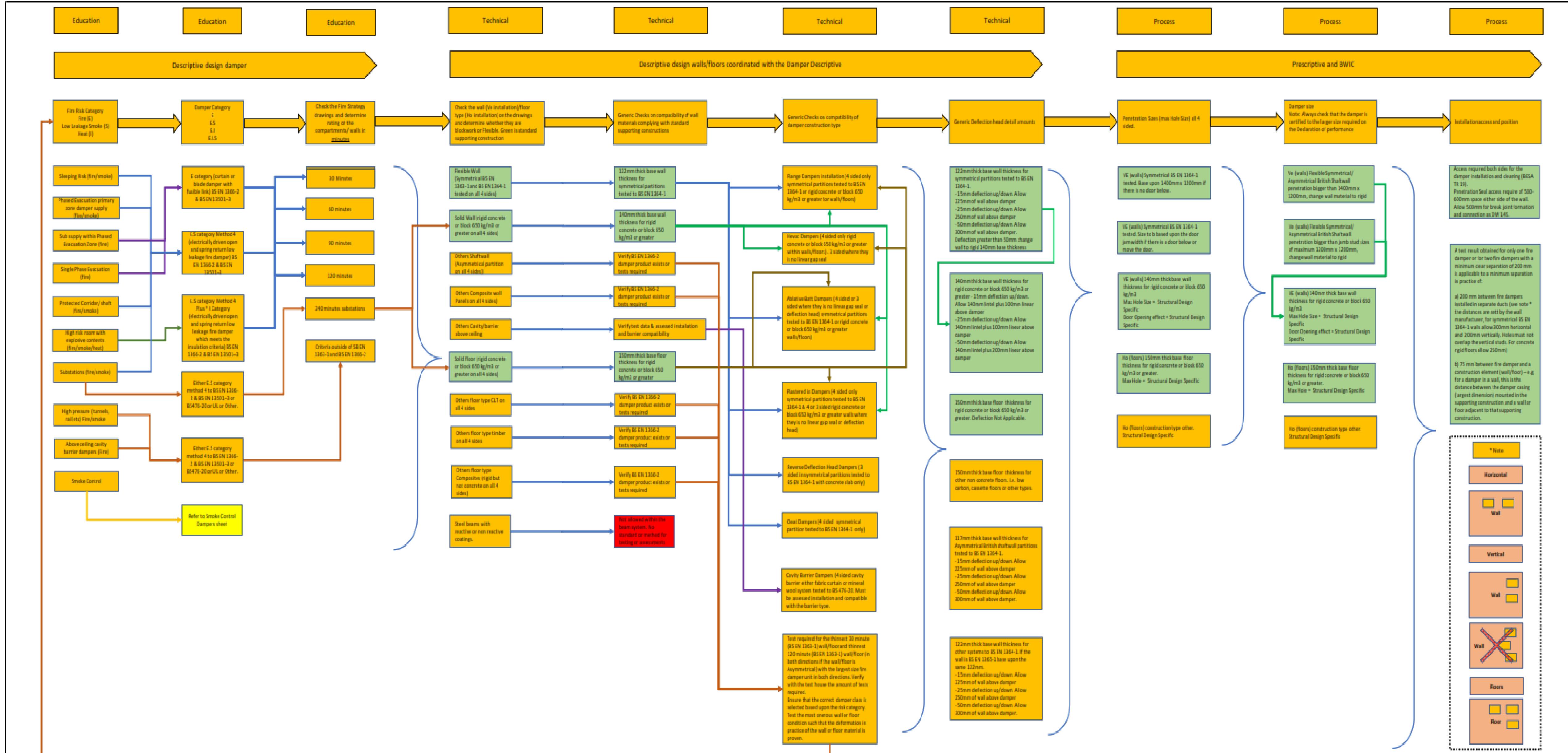
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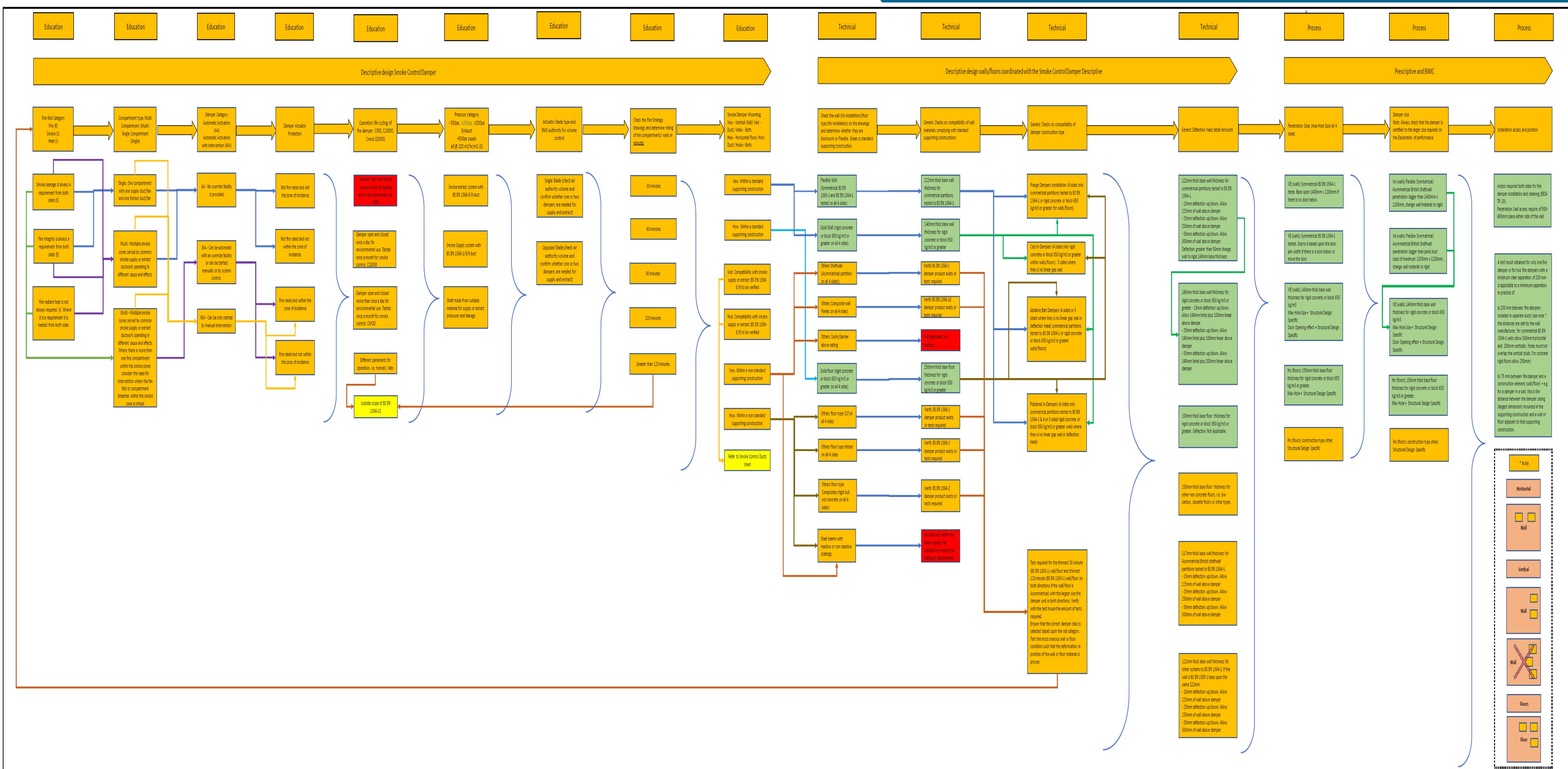
Fields of application issues.

- Distances between services vary dependent on whether they are combustible or not non combustible pipes
- The distance is different for different supplies of the penetration system supplier
- Supports have specific rules, nominally max 500mm from wall, but sponsor can test further.
- There are limitations on the maximum size of the aperture that can be tested dependent on the rating in E, I
- The maximum size is also limited with partitions to the size that the suppliers can support. Can be smaller than tested.
- Distance between adjacent aperture can is 200mm in the test. The partition suppliers will likely want more.
- Fire door partition apertures can normally not have the framing not going from the floor to ceiling.
- Dependent on the service type it is possible for a partition test to be applied to rigid walls
- Shaftwall is classed as Other Supporting Construction.
- The wall takes the deflection, not the services. No 3 sided holes with deflection details on walls. Some soft seals now available but do not assume this can work everywhere.
- Cannot change seal materials

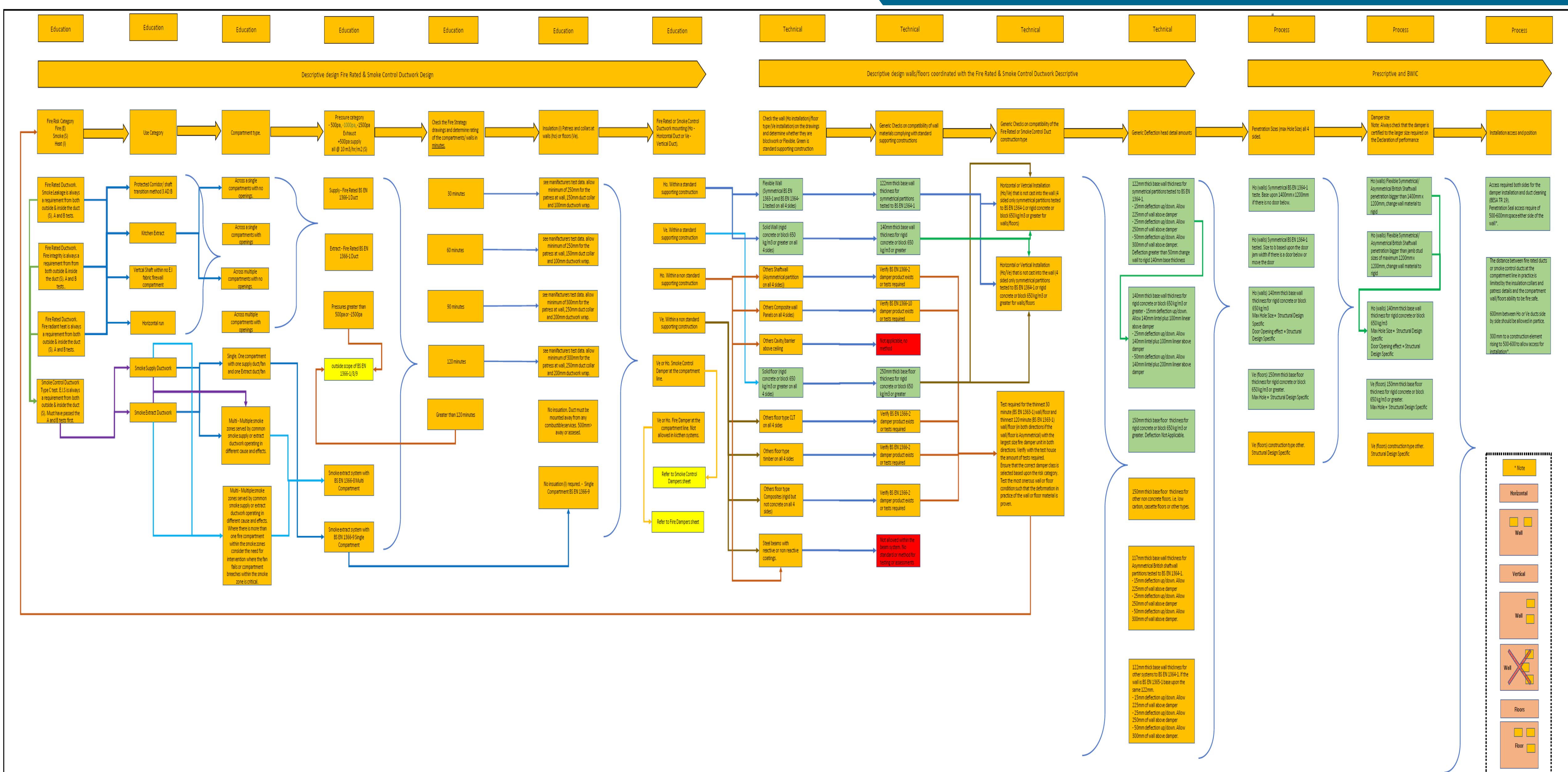
The Process required for descriptive Fire Dampers.



The Process required for descriptive Smoke Control Dampers.

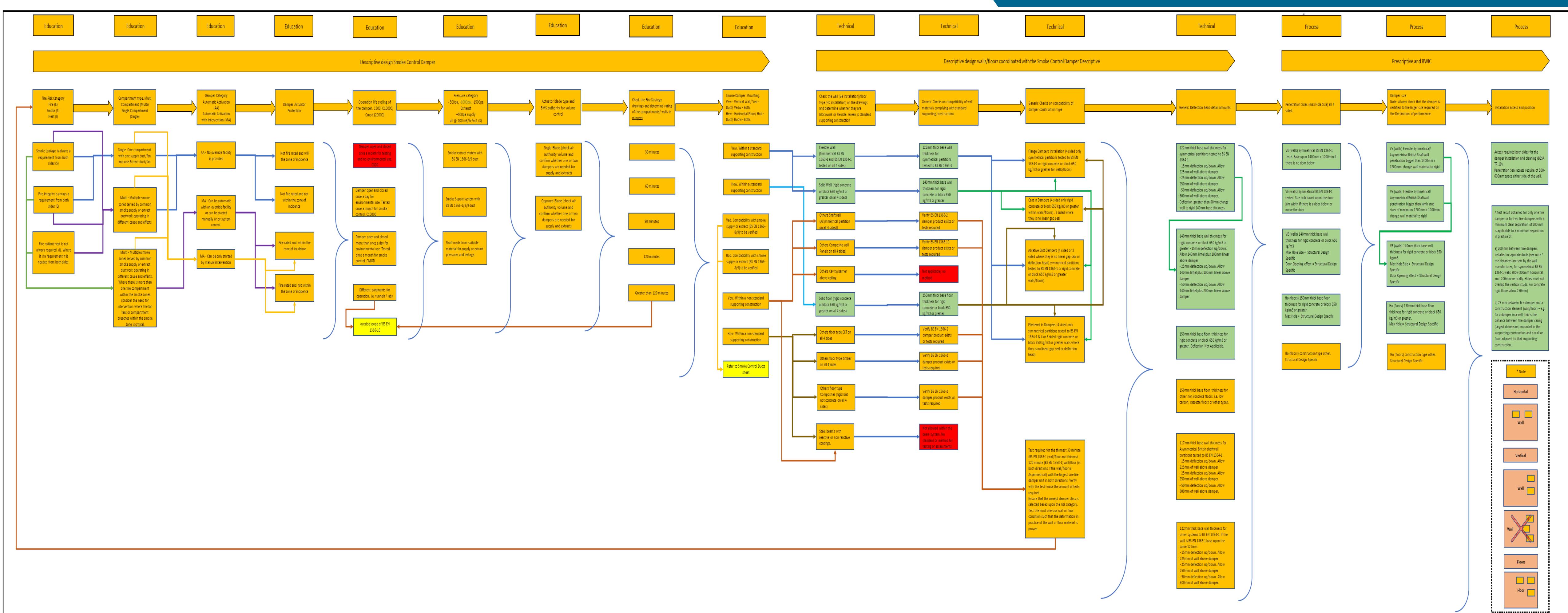
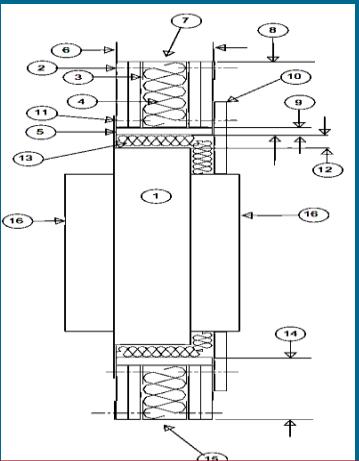
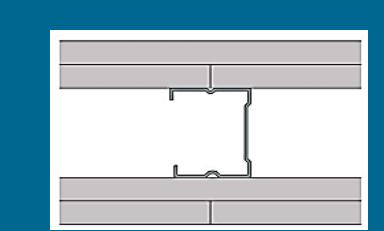
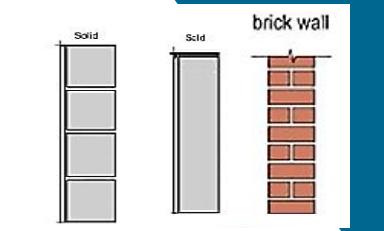
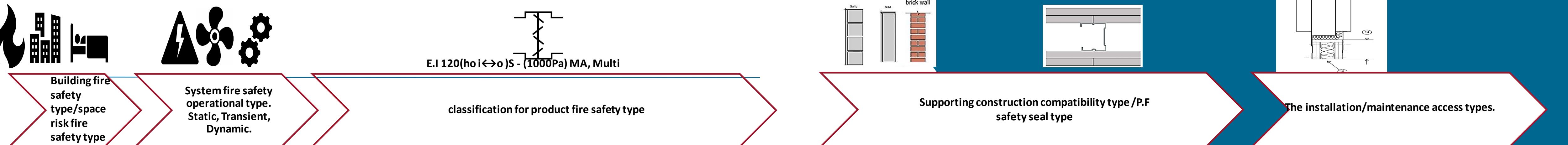


The Process required for descriptive Fire Rated Ductwork and Smoke Control.



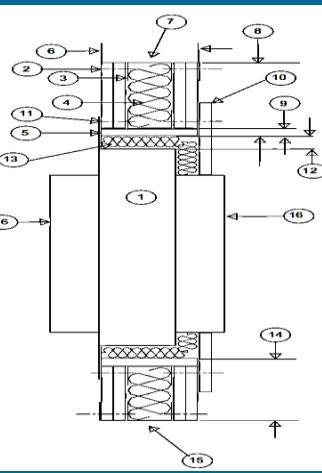
The Process required for descriptive Smoke Control Dampers.

Simplification of the below flow diagram follows.



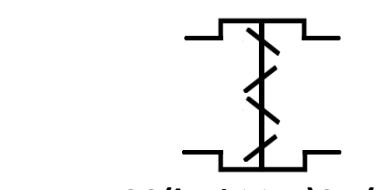
The Process required for descriptive Fire Rated Ductwork and Smoke Control.

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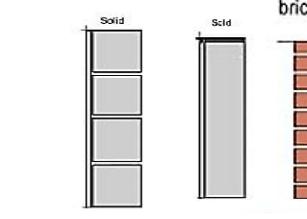


Building fire safety type/space risk fire safety type

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

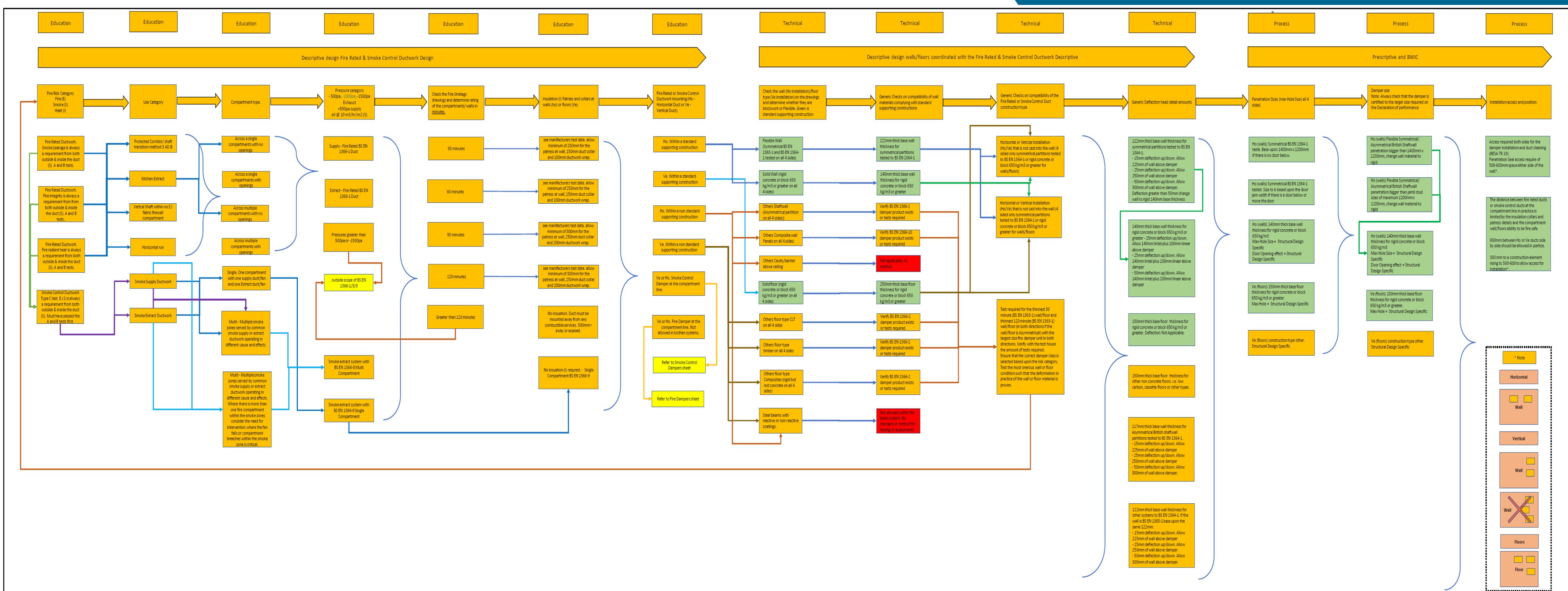


classification for product fire safety type



Supporting construction compatibility type /P.F safety seal type

The installation/maintenance access types.



The Process required for descriptive Fire Dampers

Simplification of the below flow diagram follows.



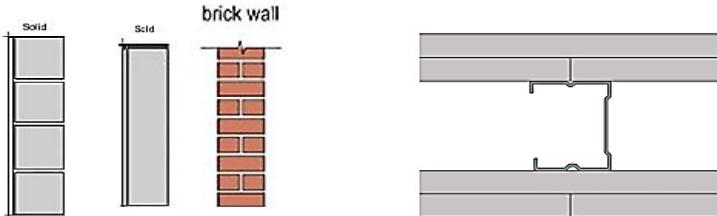
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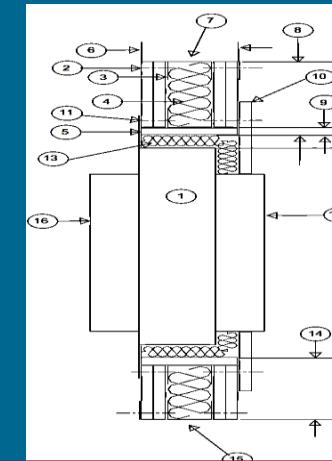
The symbol for a bidirectional optoisolator. It consists of two optocoupler symbols connected in series. Each optocoupler is represented by a rectangle with a diagonal line through it, indicating light transmission. The two optocouplers are connected in series, with the second one having its output terminal connected to the first one's input terminal. The entire assembly is enclosed in a rectangular frame with two output terminals at the bottom.

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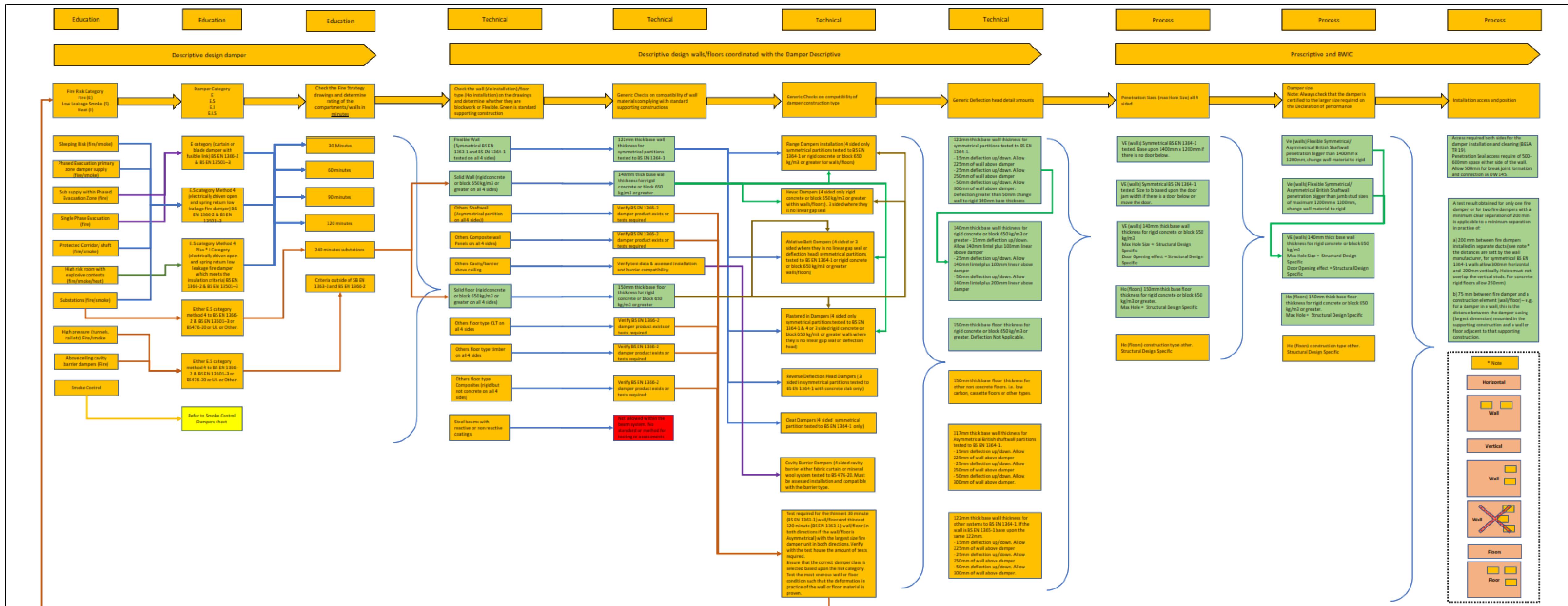


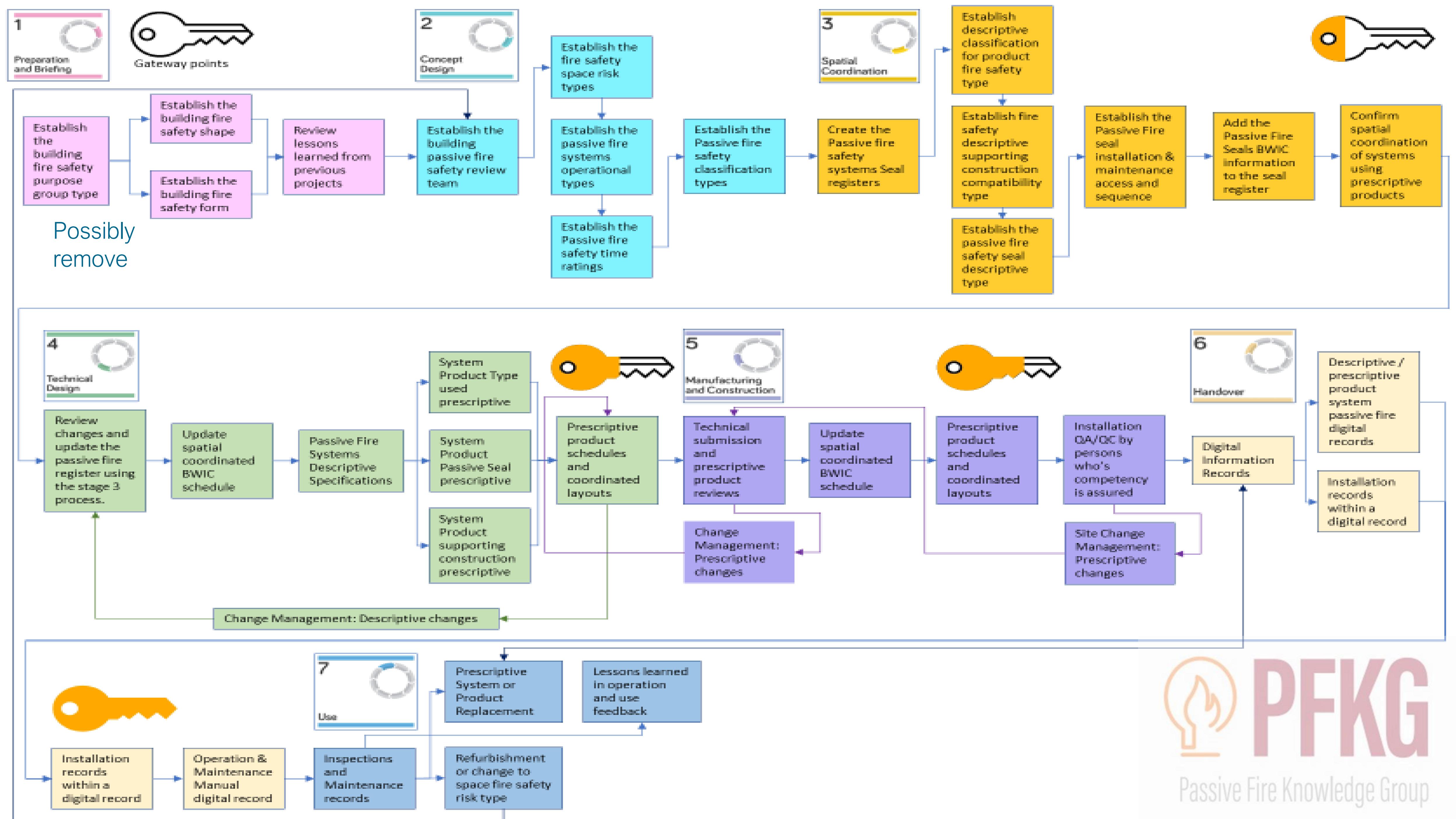
classification for product fire safety type

Supporting construction compatibility type /P.F safety seal type



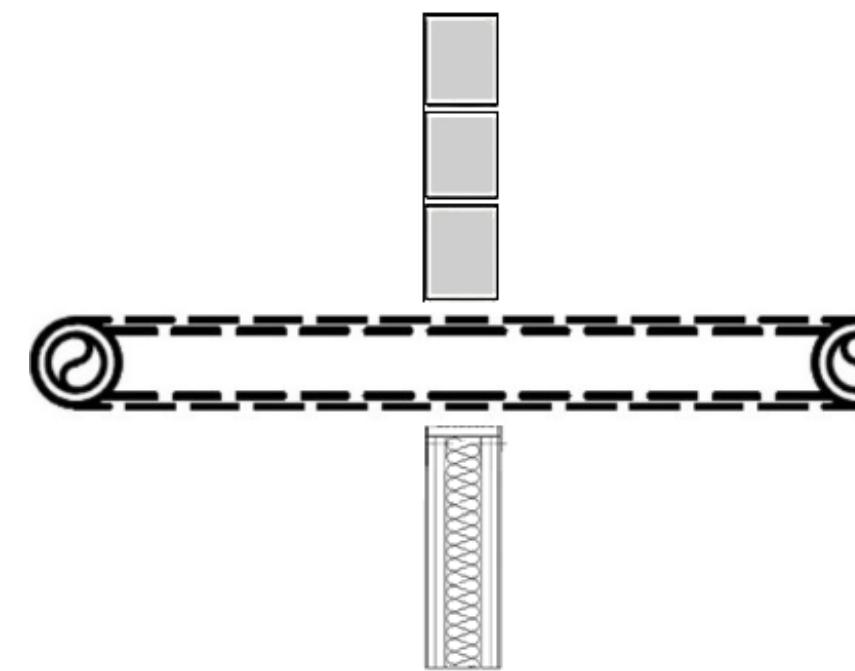
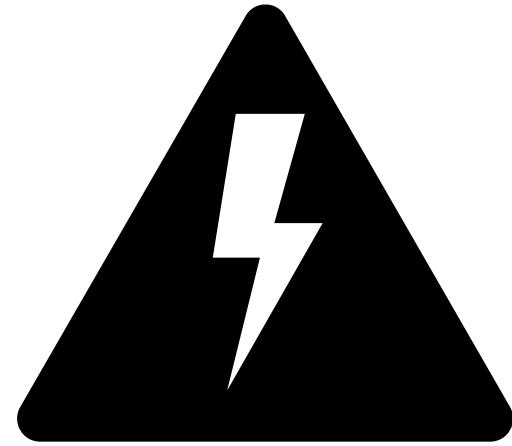
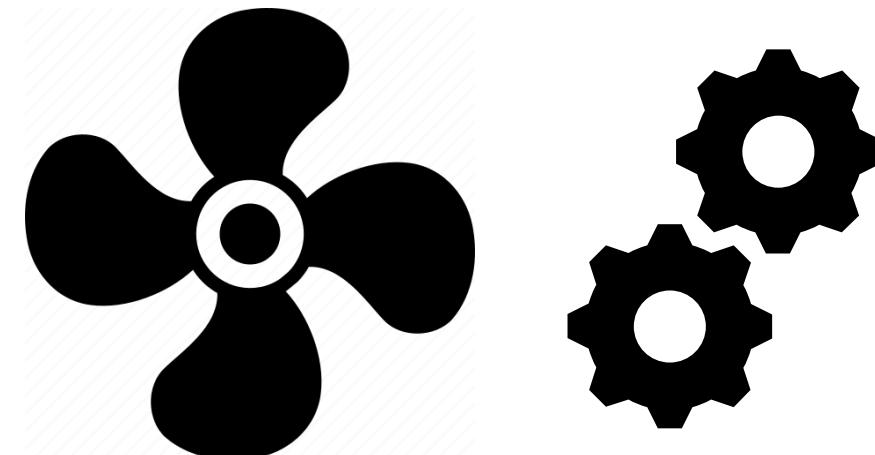
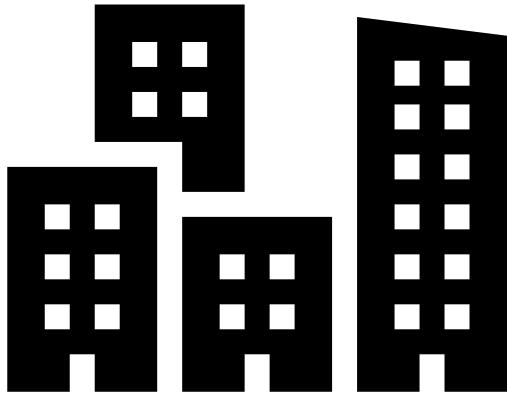
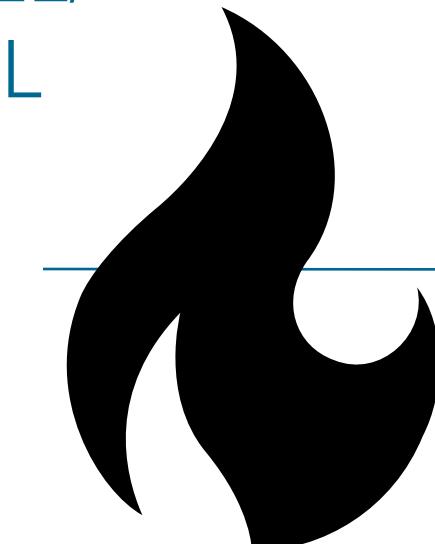
The installation/maintenance access types.



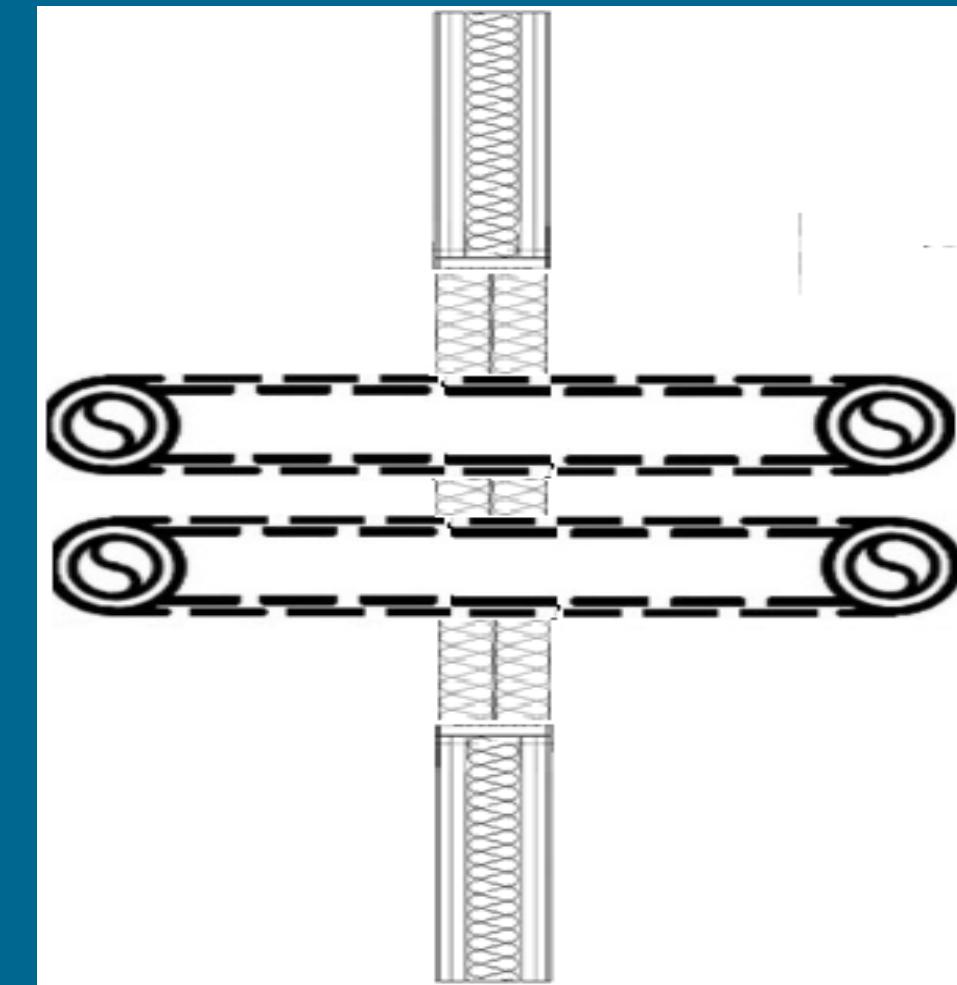
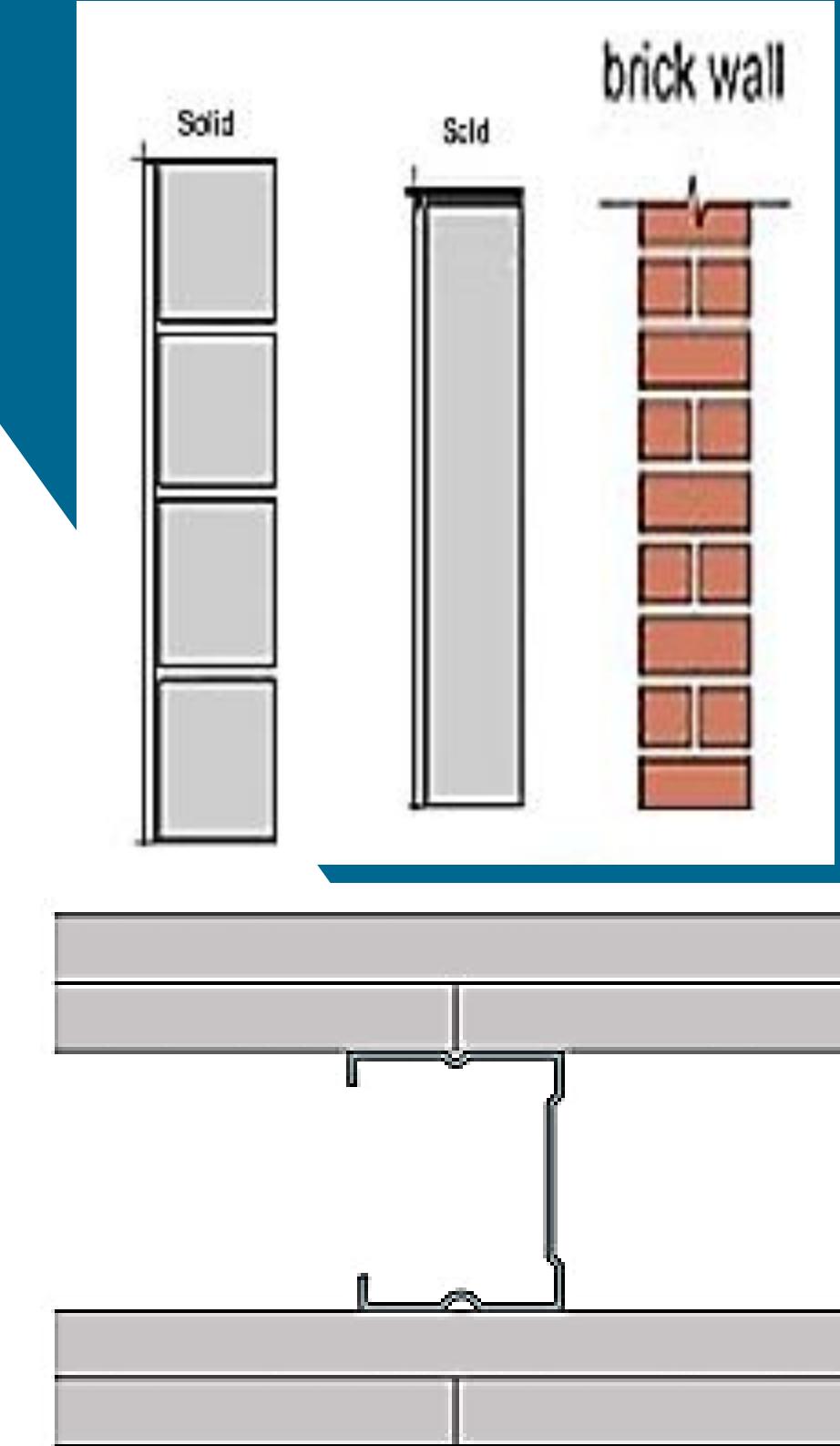


The Process required for descriptive

DR
NIGEL/
PAUL



E.I 120 H/V (U/C C/U/ U/U
C/C) (CS,CI,LS,LI)



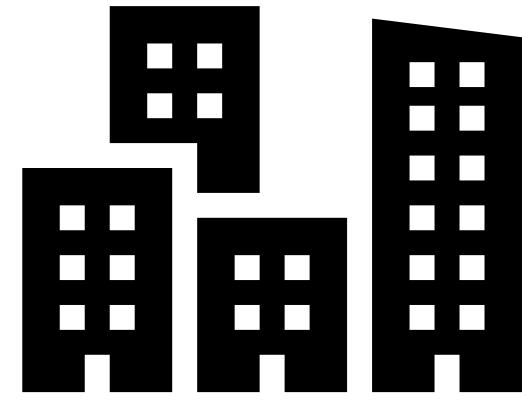
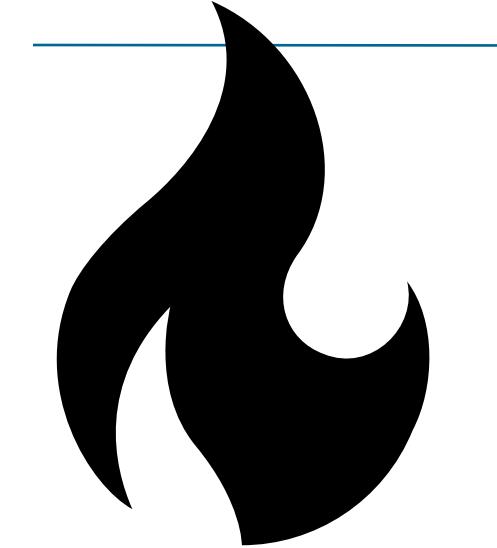
Building fire safety type/space risk
fire safety type

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

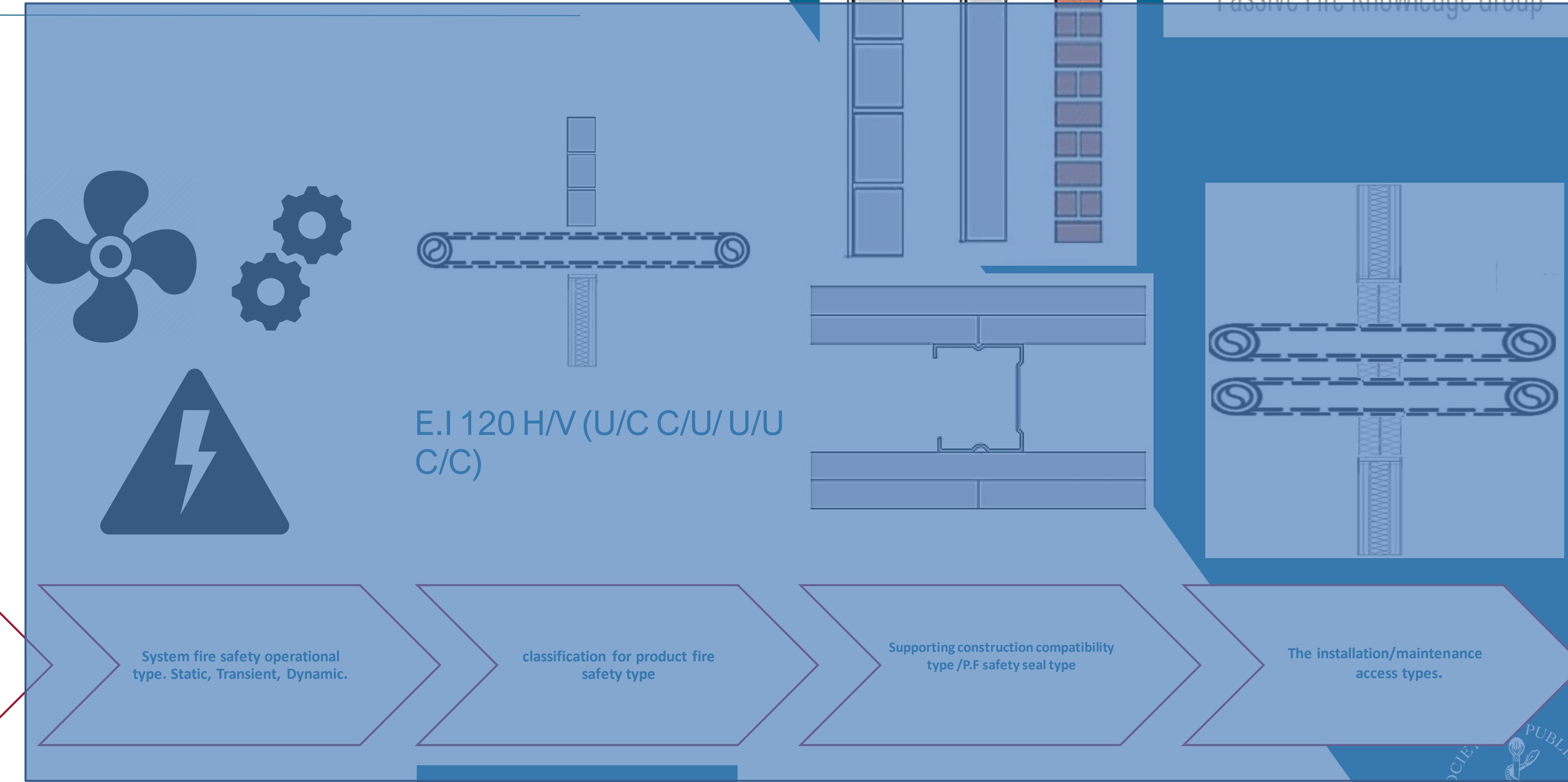
classification for product fire safety
type

Supporting construction compatibility
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The installation/maintenance
access types.

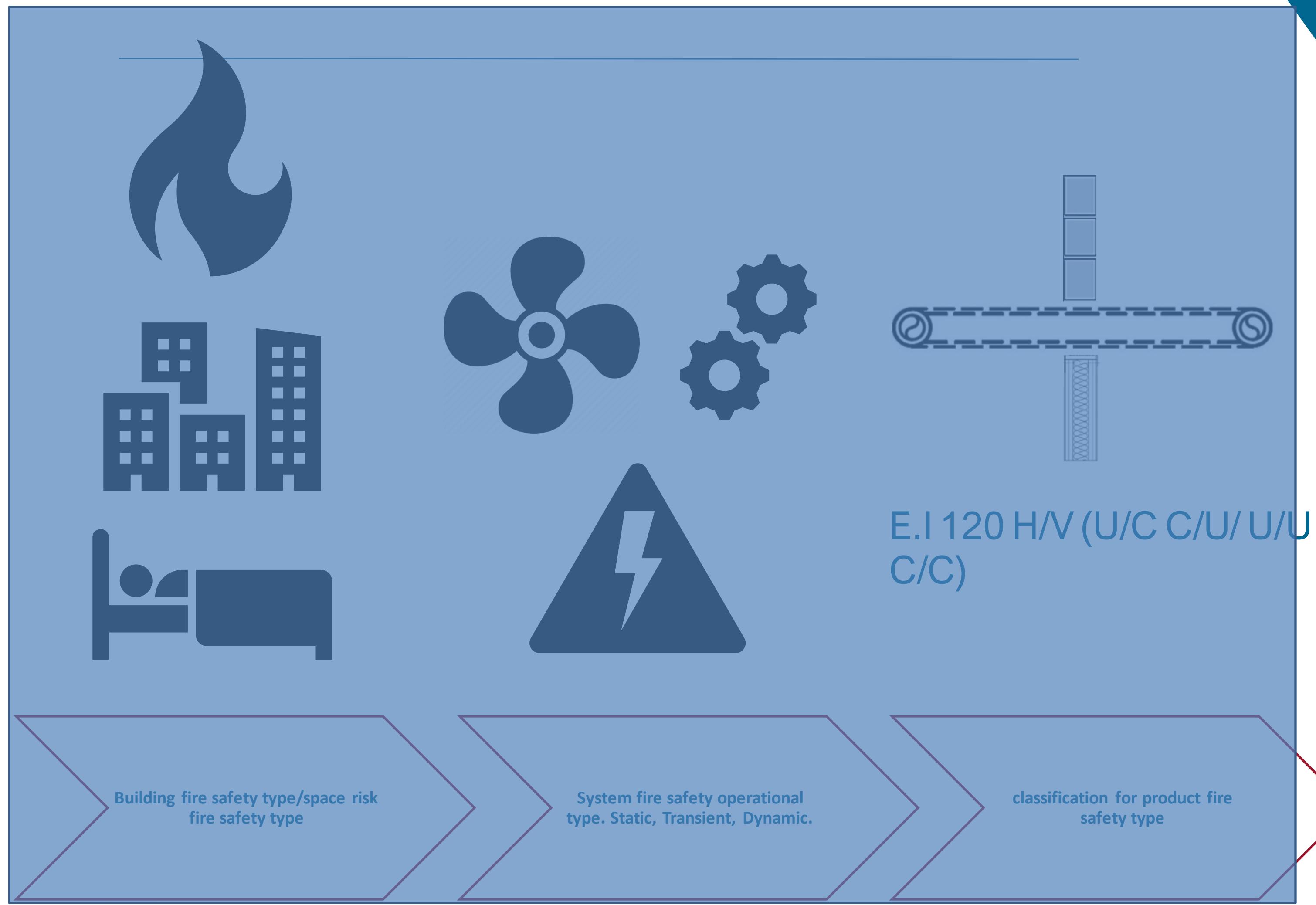


Building fire safety type/space risk
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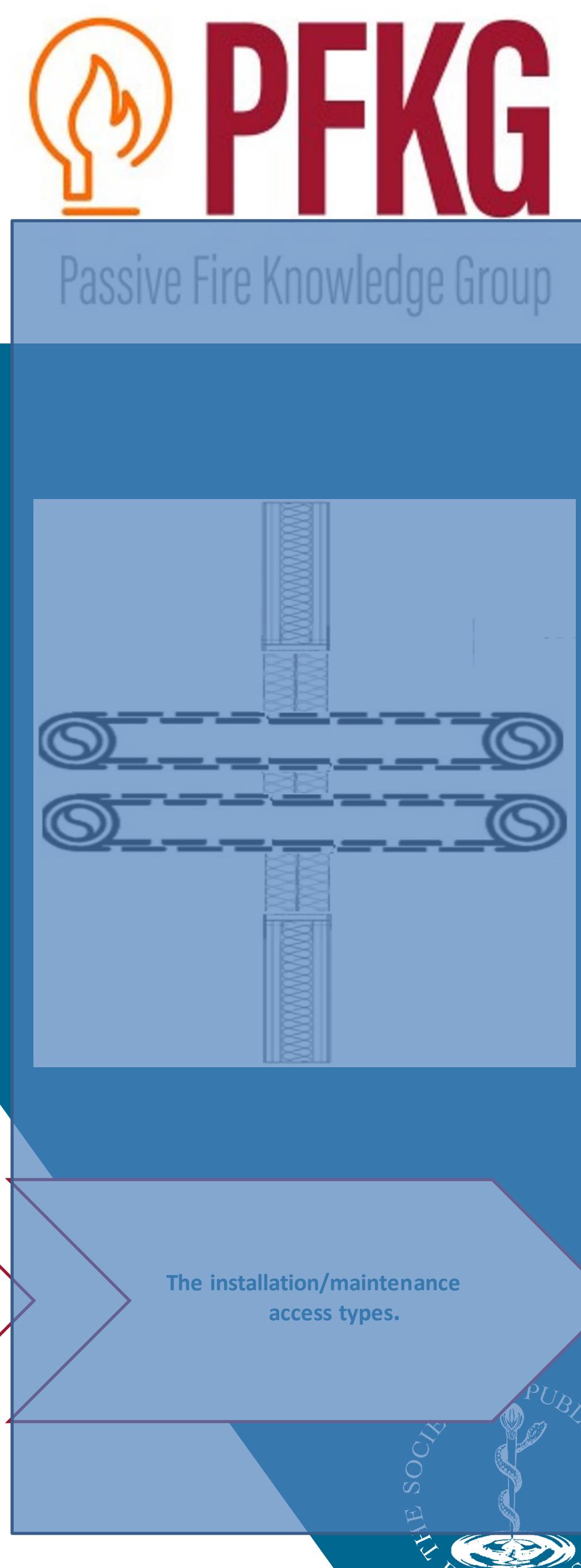
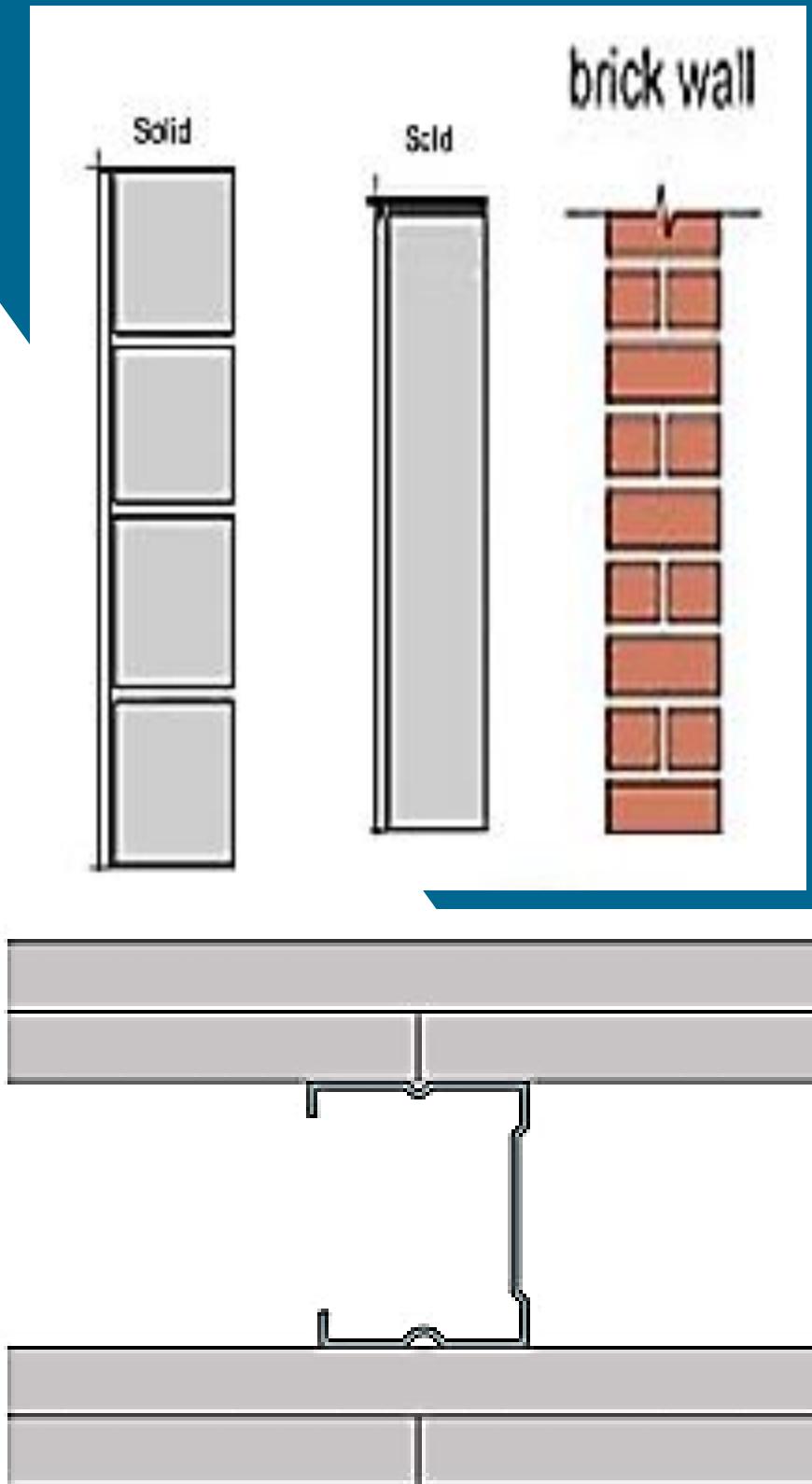


Blue = Out of knowledge field

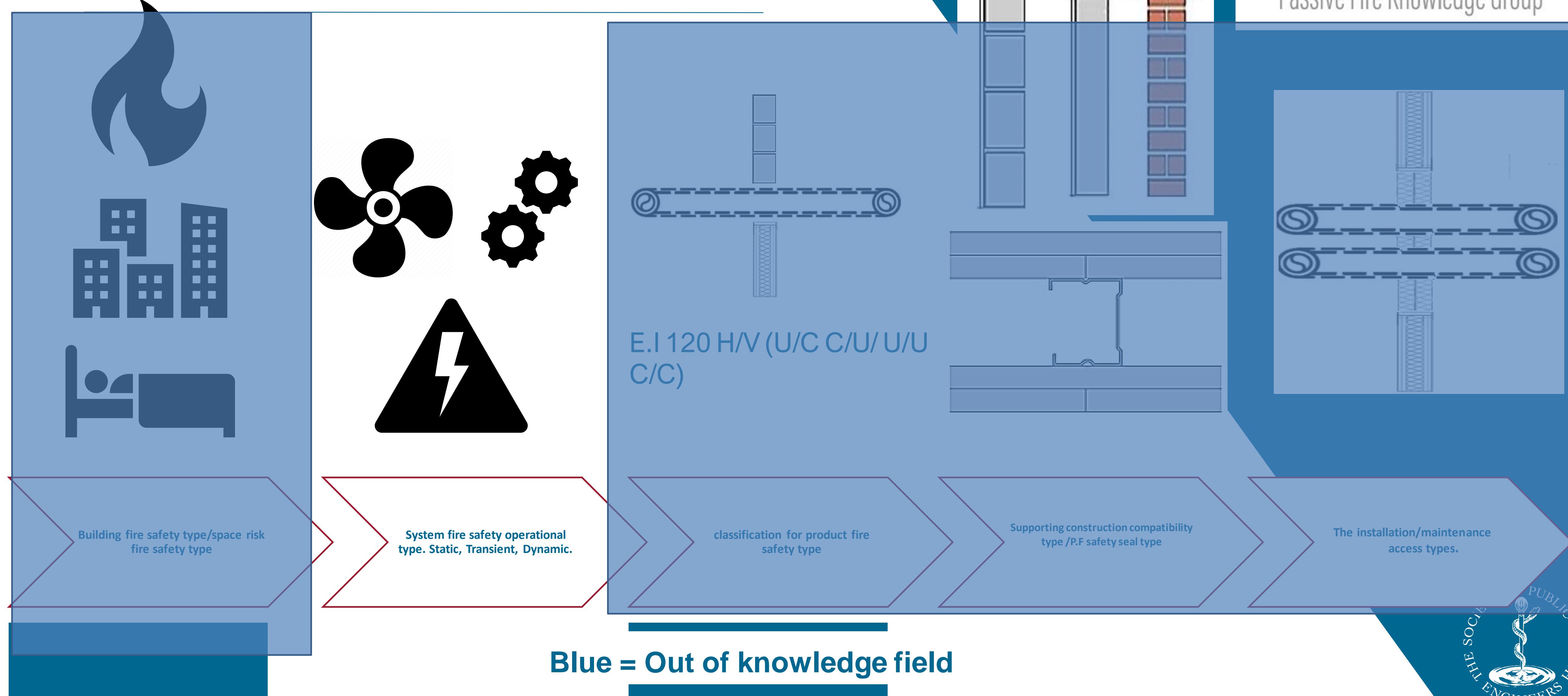
Architect



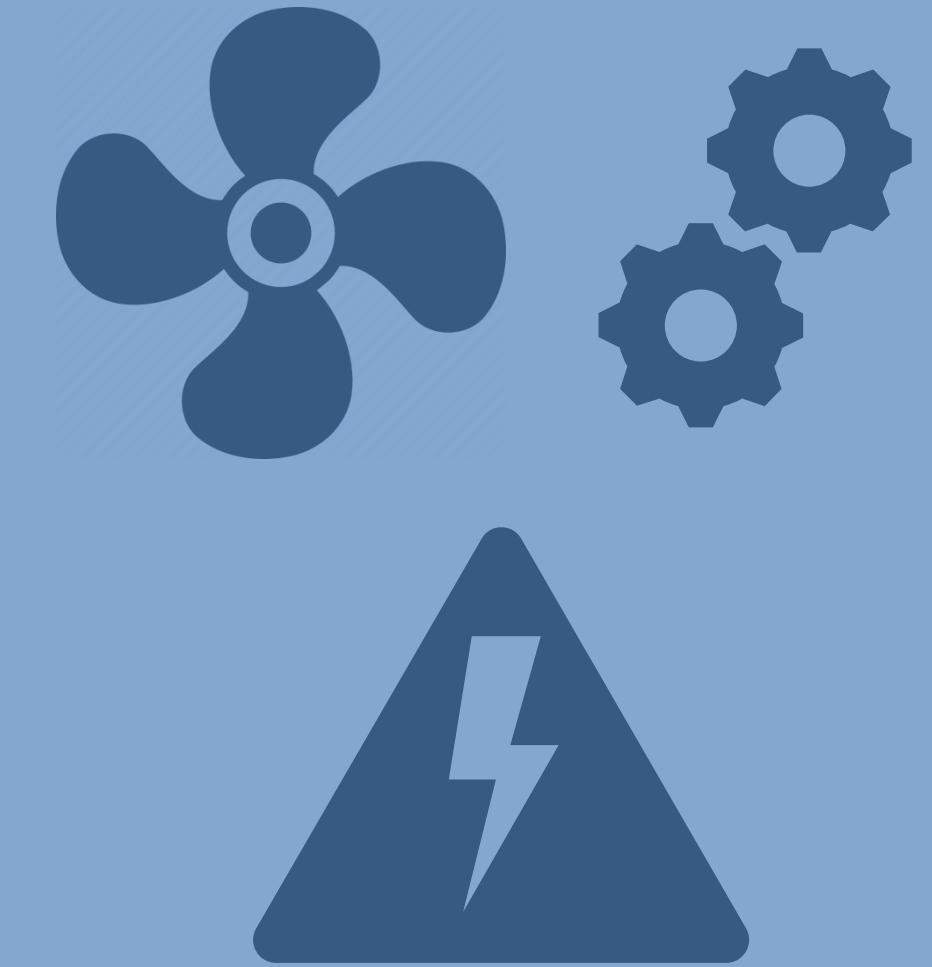
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Building Services Consultant

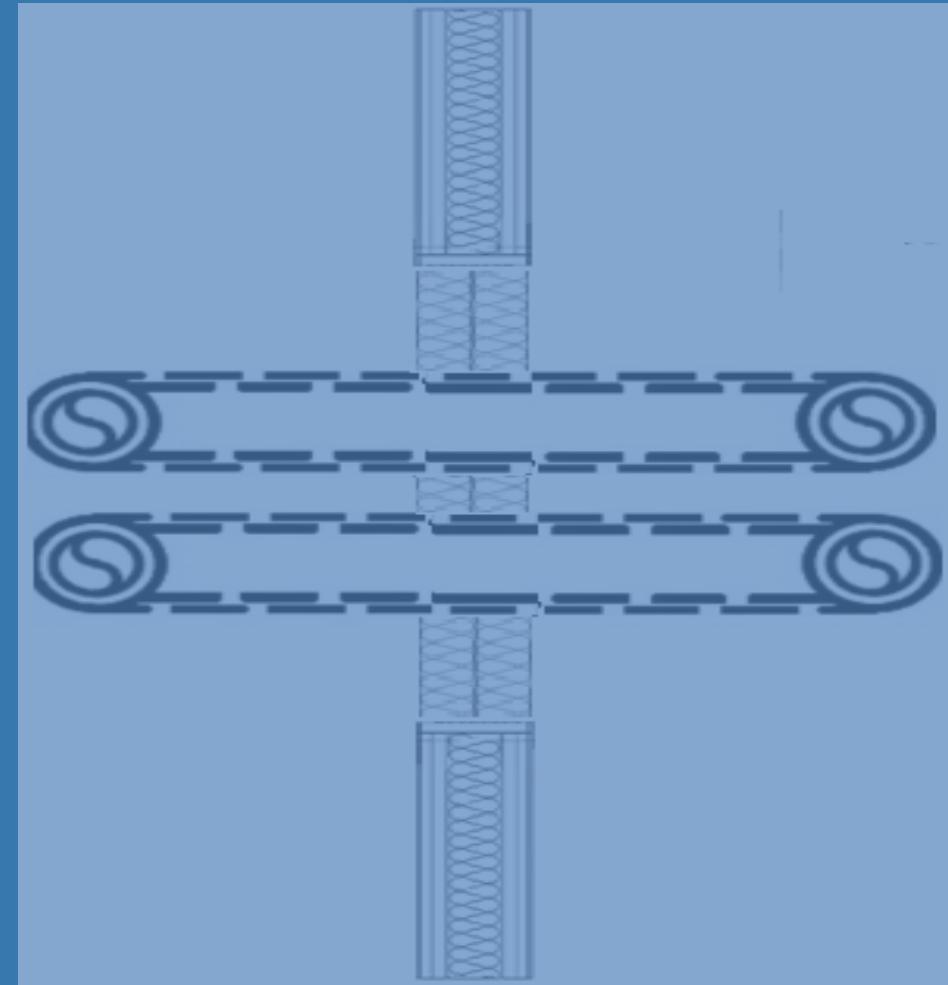
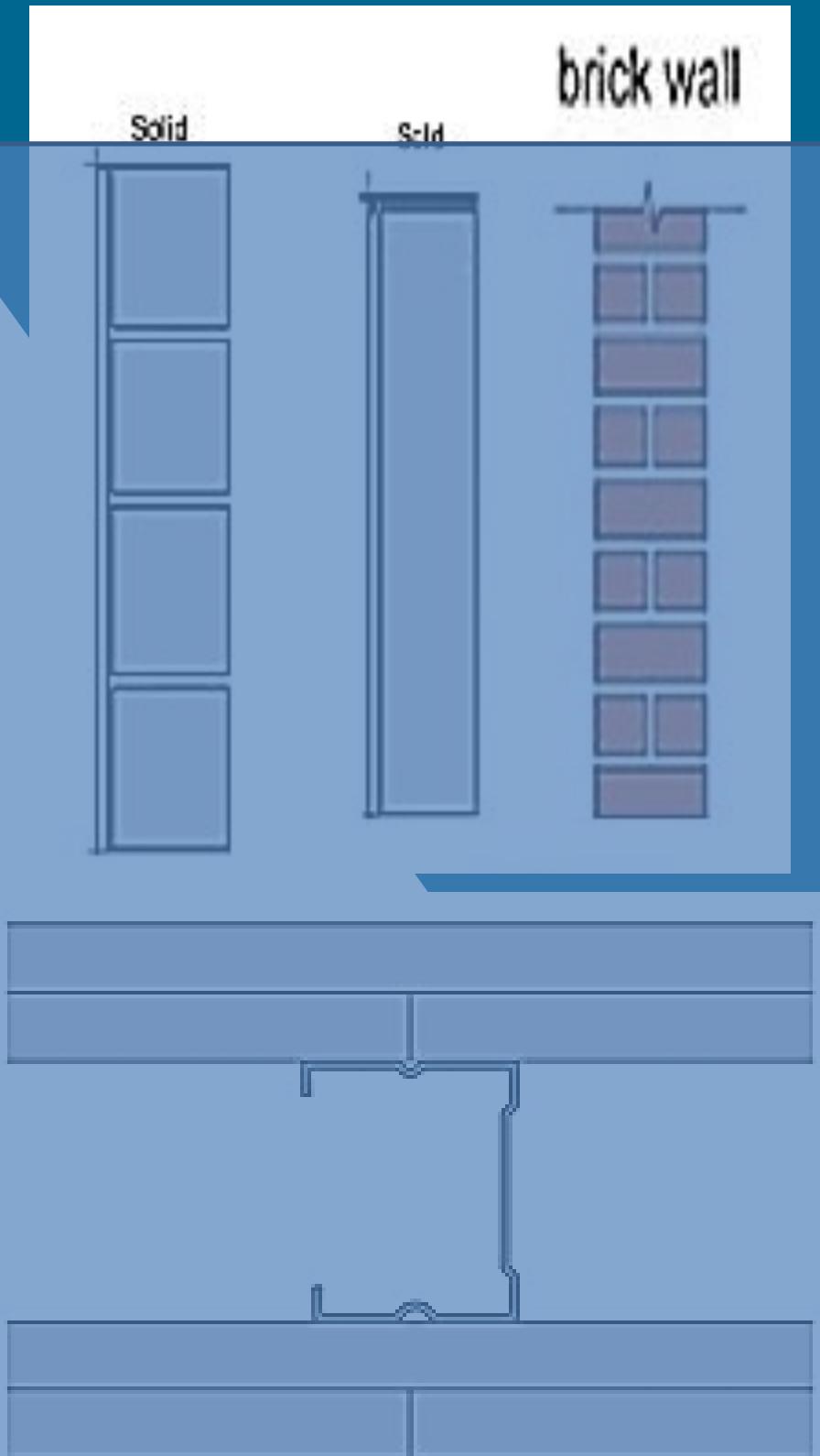


Principle Contractor



E.I 120 H/V (U/C C/U/ U/U
C/C)

Blue = Out of knowledge field



Building fire safety type/space risk fire safety type

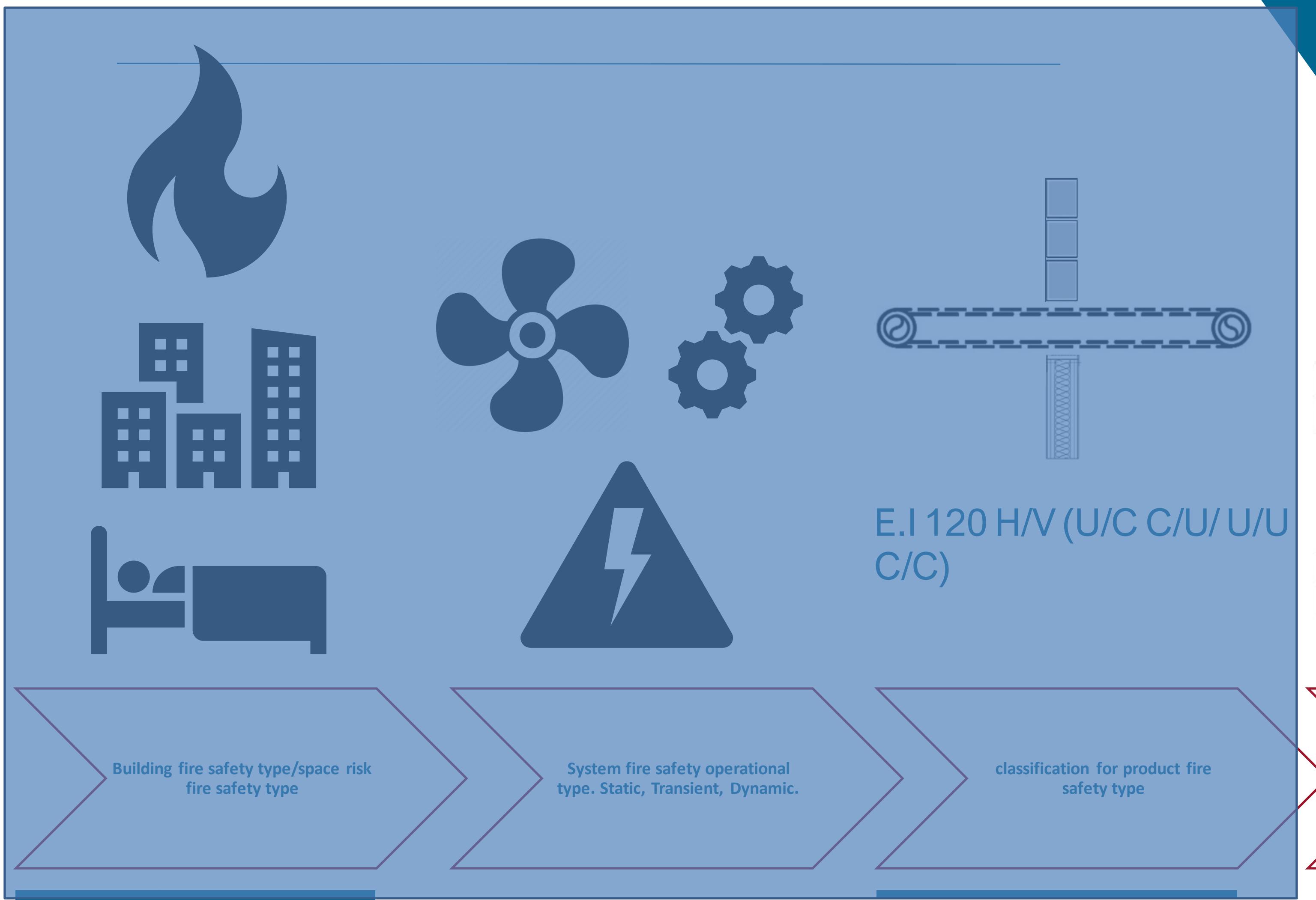
System fire safety operational type. Static, Transient, Dynamic.

classification for product fire safety type

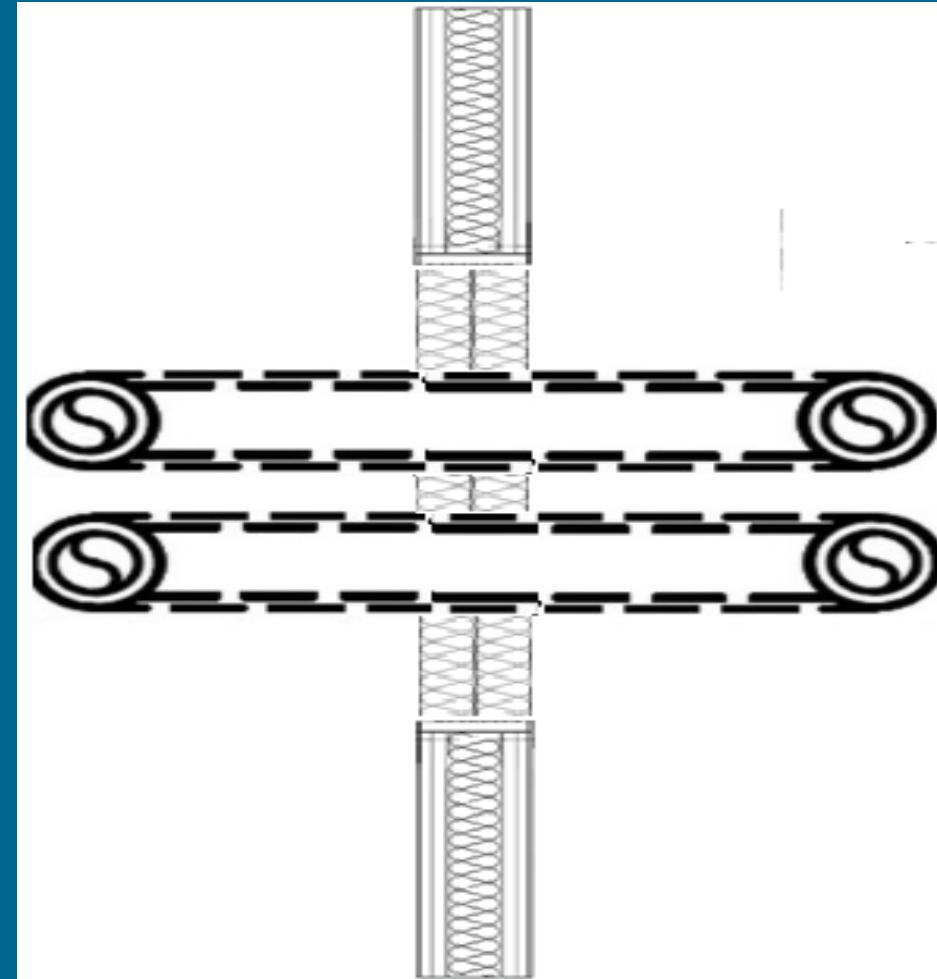
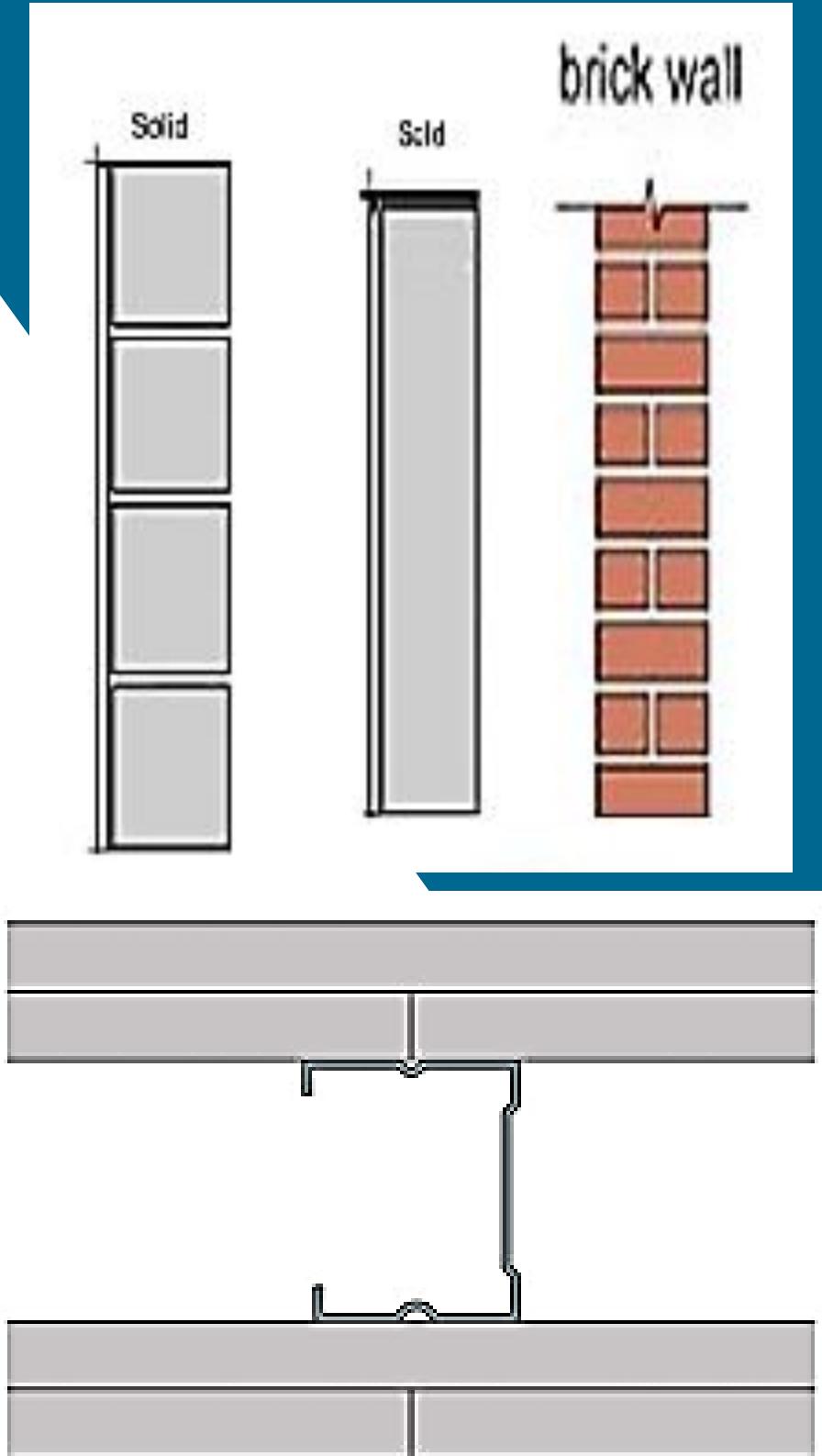
Supporting construction compatibility type /P.F safety seal type

The installation/maintenance access types.

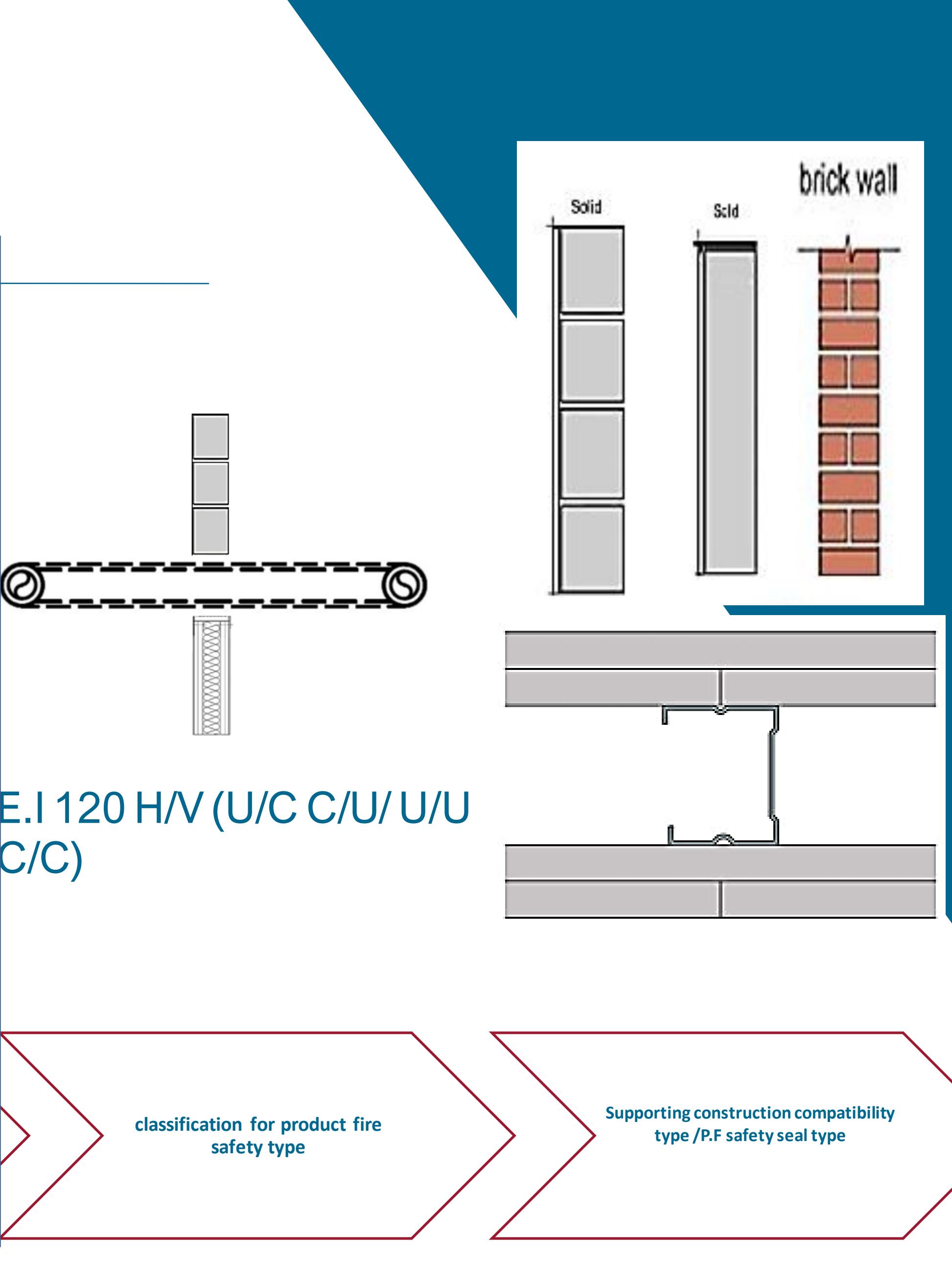
Specialist Trade



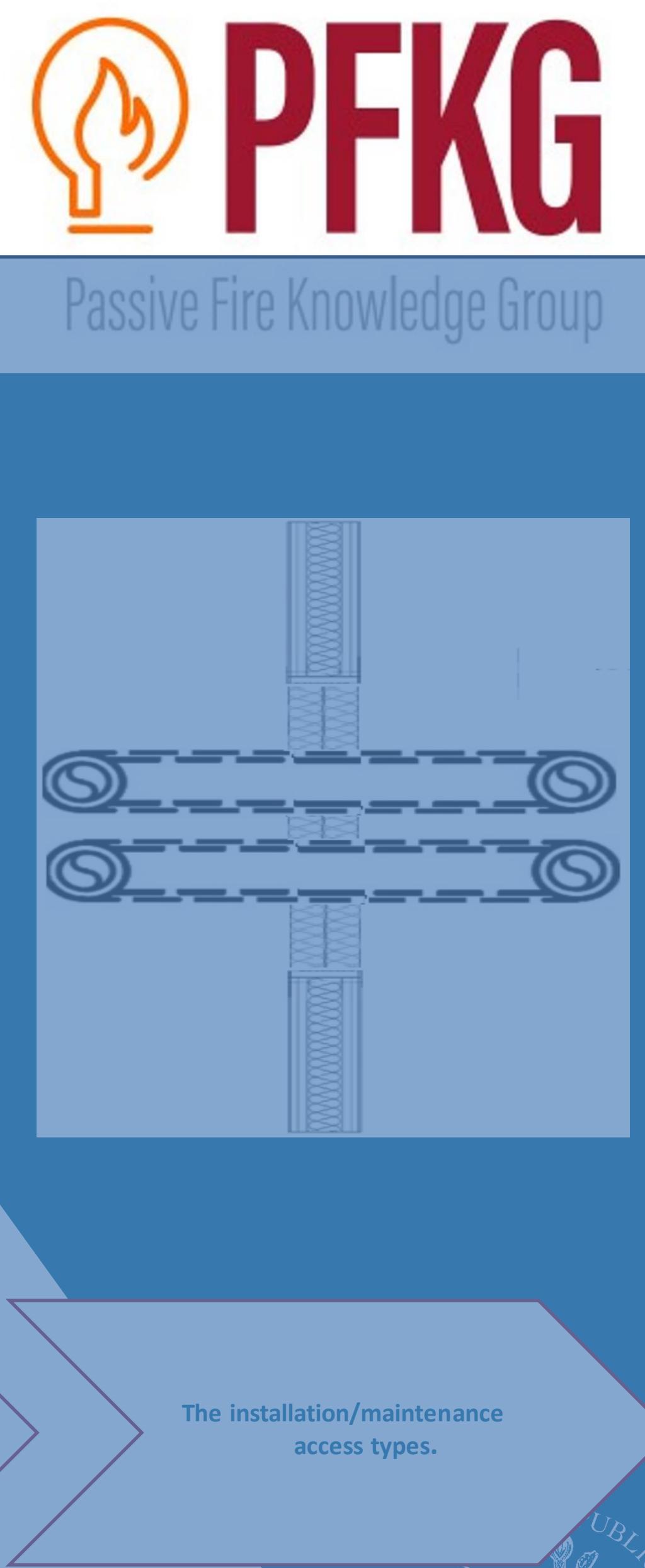
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Product Supplier

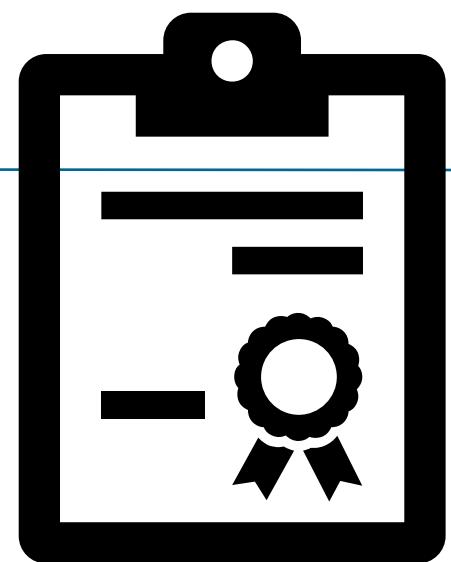


Blue = Out of knowledge field



Outputs

NIGEL/
DREW/
PAUL



Known installation records
prescriptive digital
information

Quality parameters &
workmanship standards

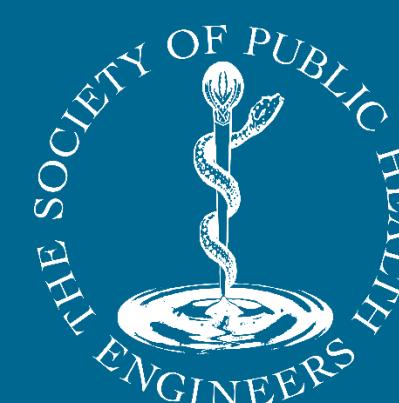
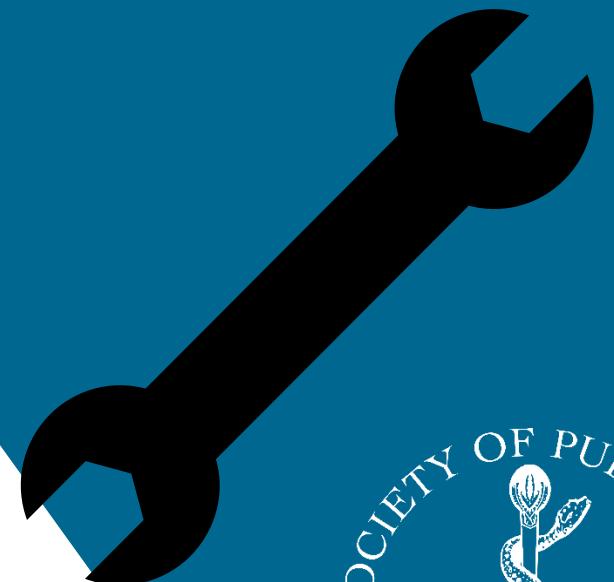
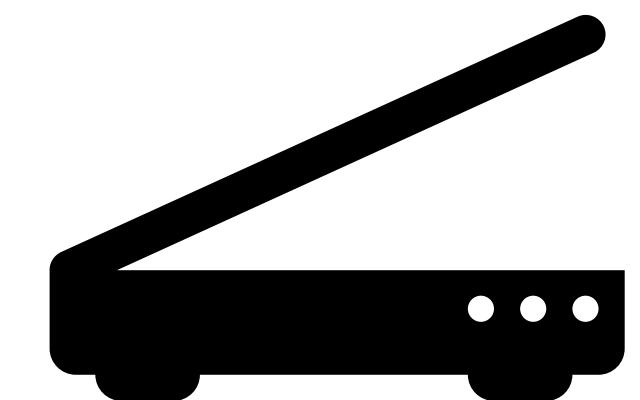
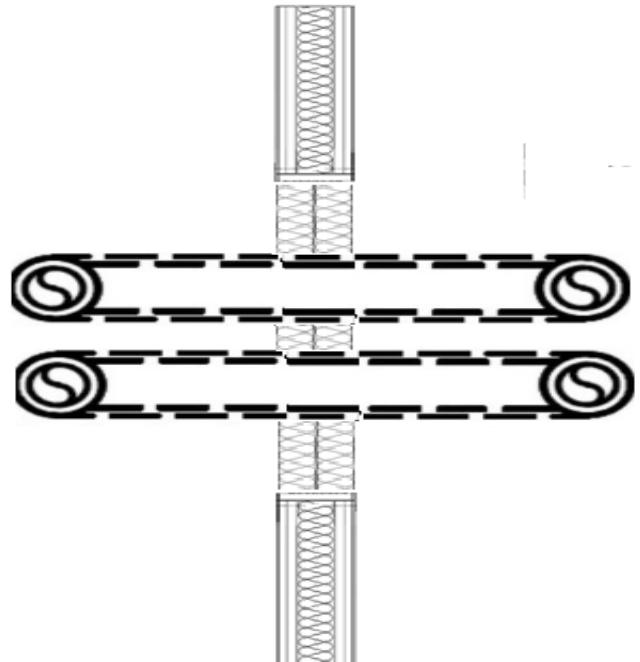
Benchmarking

Installation acceptance

Digital Records

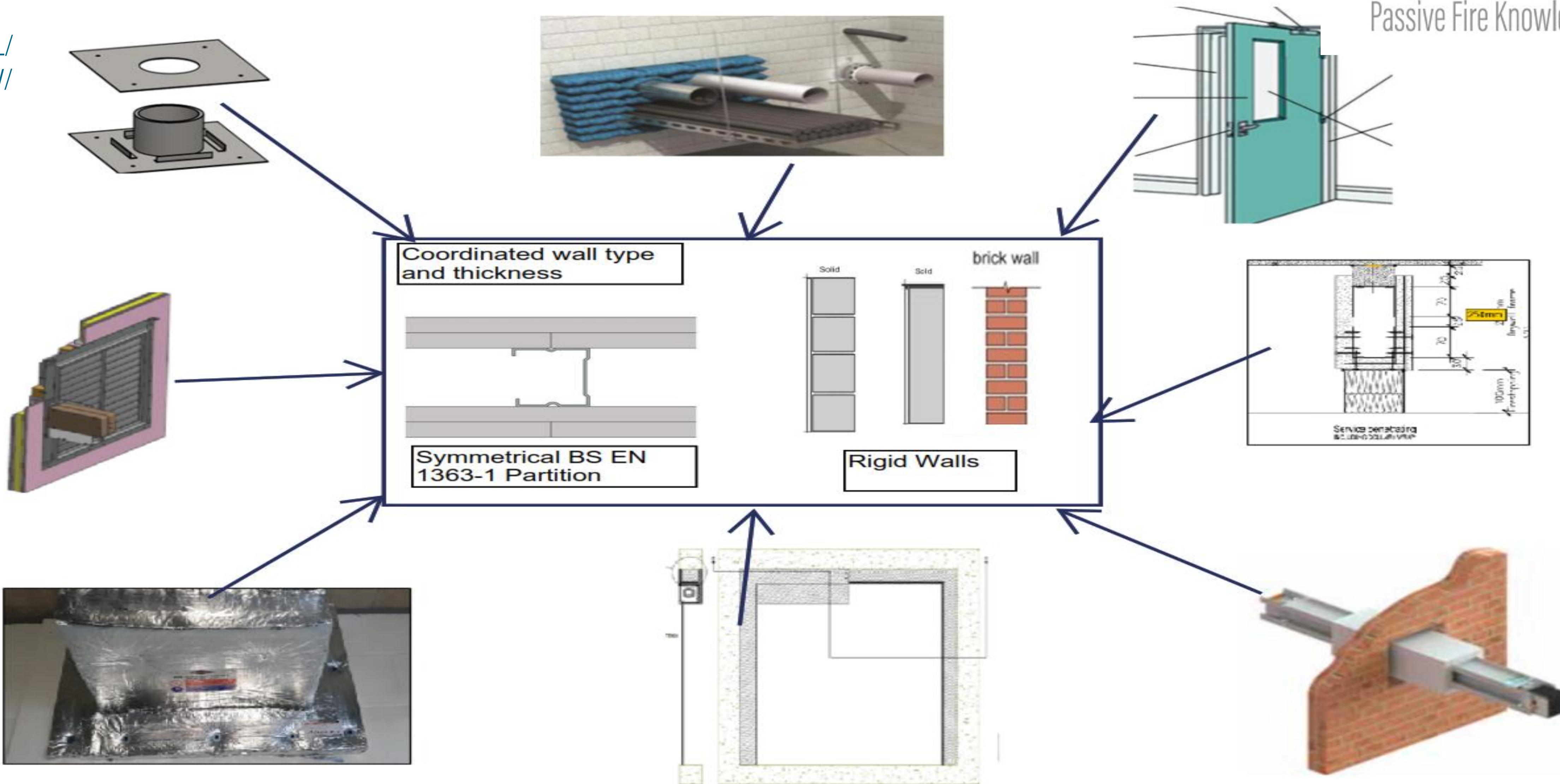
Information for future
change management

operating & maintenance
instructions.



Key Topics – Design Review – BIM

NIGEL/ DREW/ PAUL



Key Topics – Design Review – BIM

RIBA PFS

Product & Wall
Classification

Asset & Bim GTI
Classification

BWIC Process

BWIC Records

RACI

Work Books

BIM Record

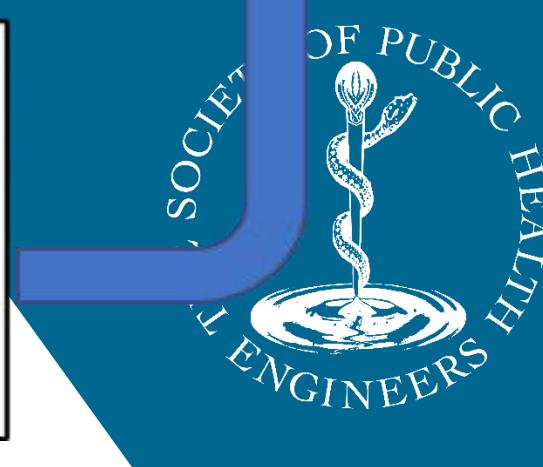
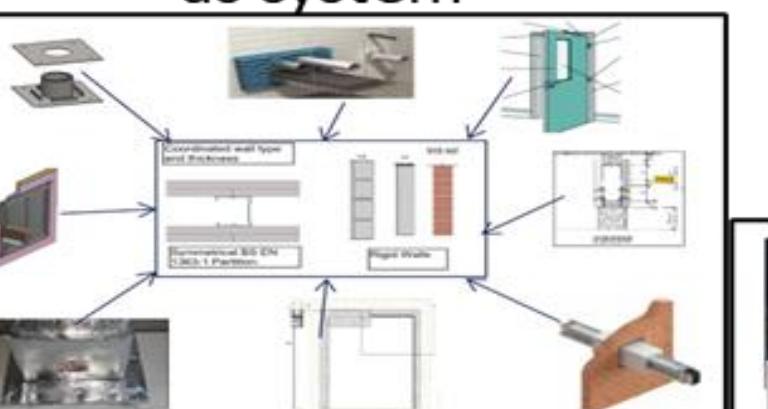
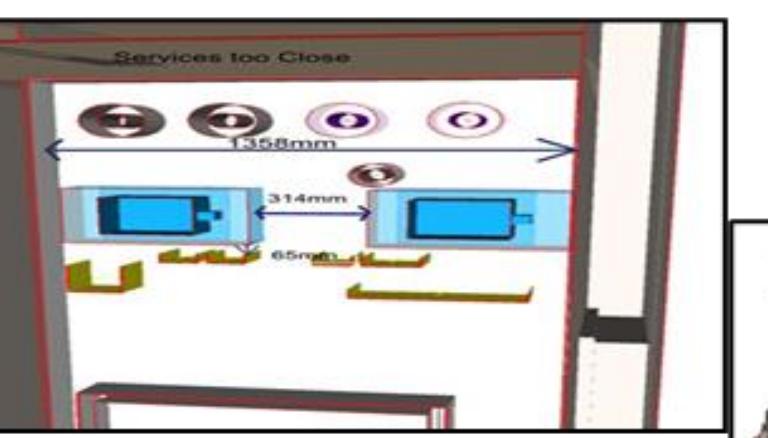
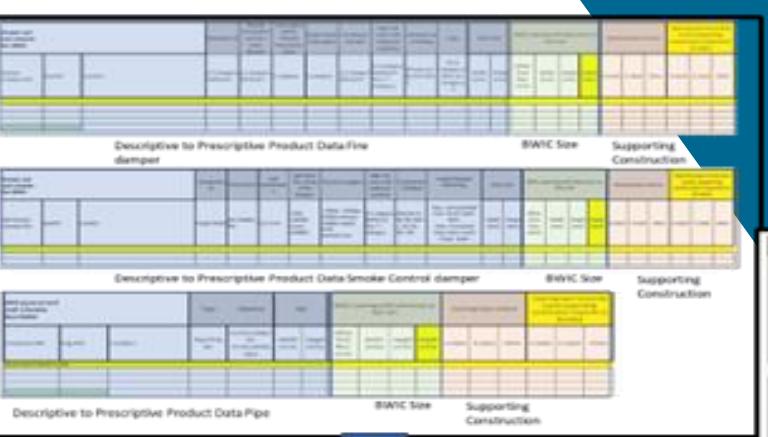
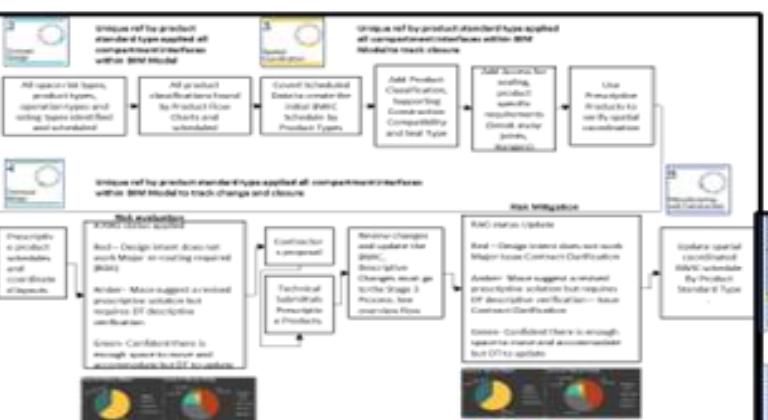
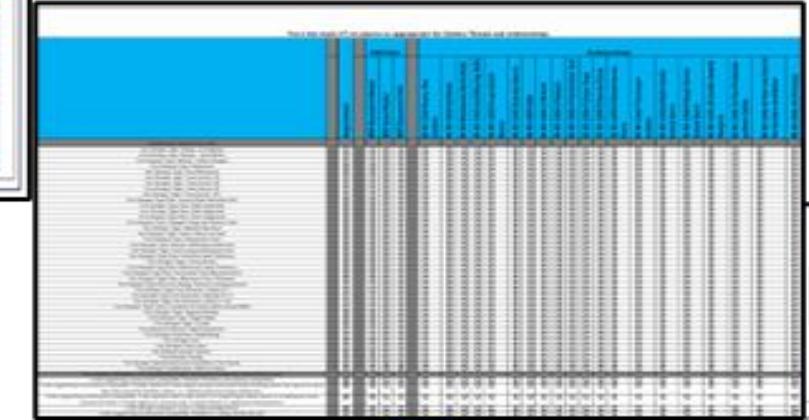
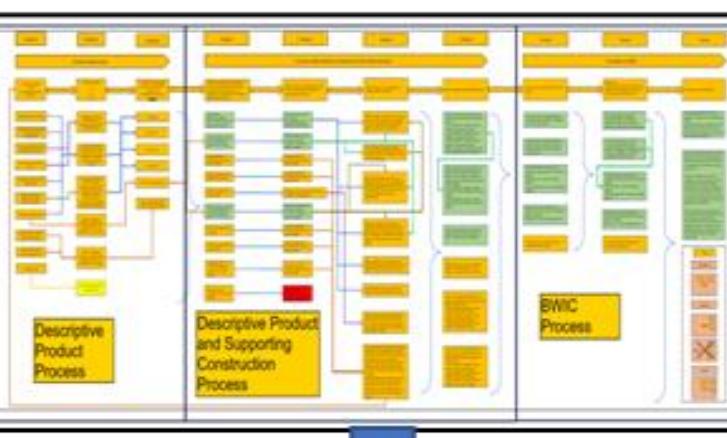
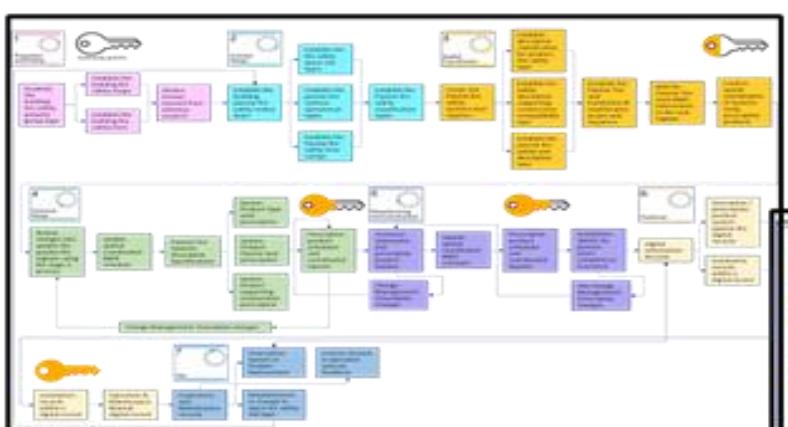
Installation, Inspection
and Digital Record

CDE

Coordination of wall
as system

Recorded and location
logged

In Use



The Process required for descriptive pipework

NIGEL/
DREW/
PAUL

Example:

Refuge in protected corridor with
pipe work transition

See para 10.15

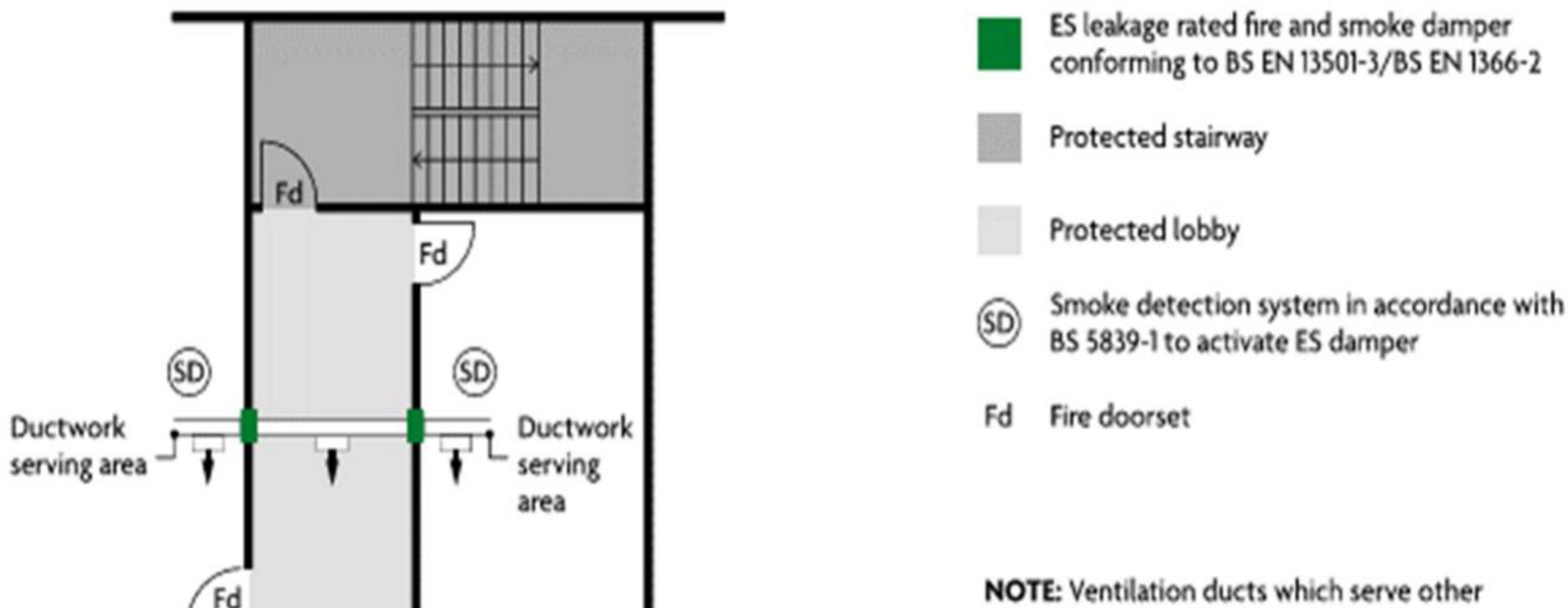
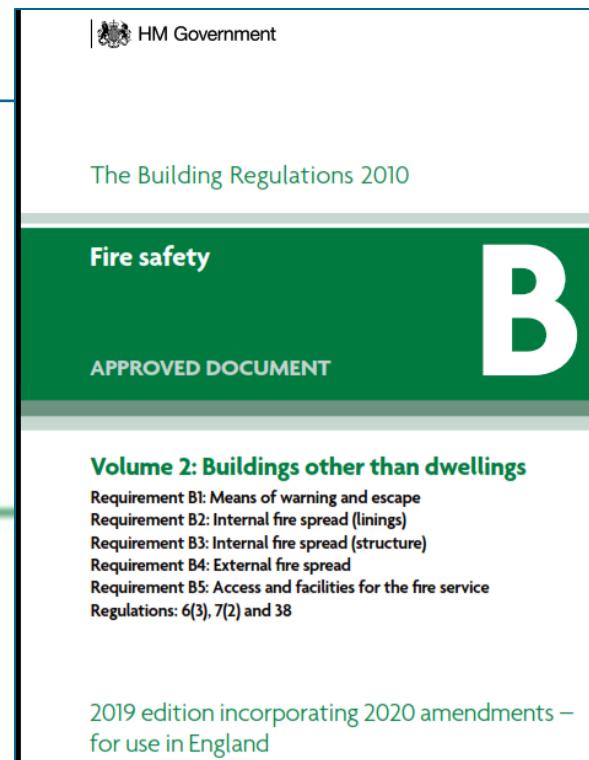


Diagram 10.3 Ductwork passing through protected escape routes – method 4



Fire resistance tests for service installations

BS EN 1366-

3

Part 3: Penetration seals

Key Classifications

(E) – Integrity

(I) – Insulation

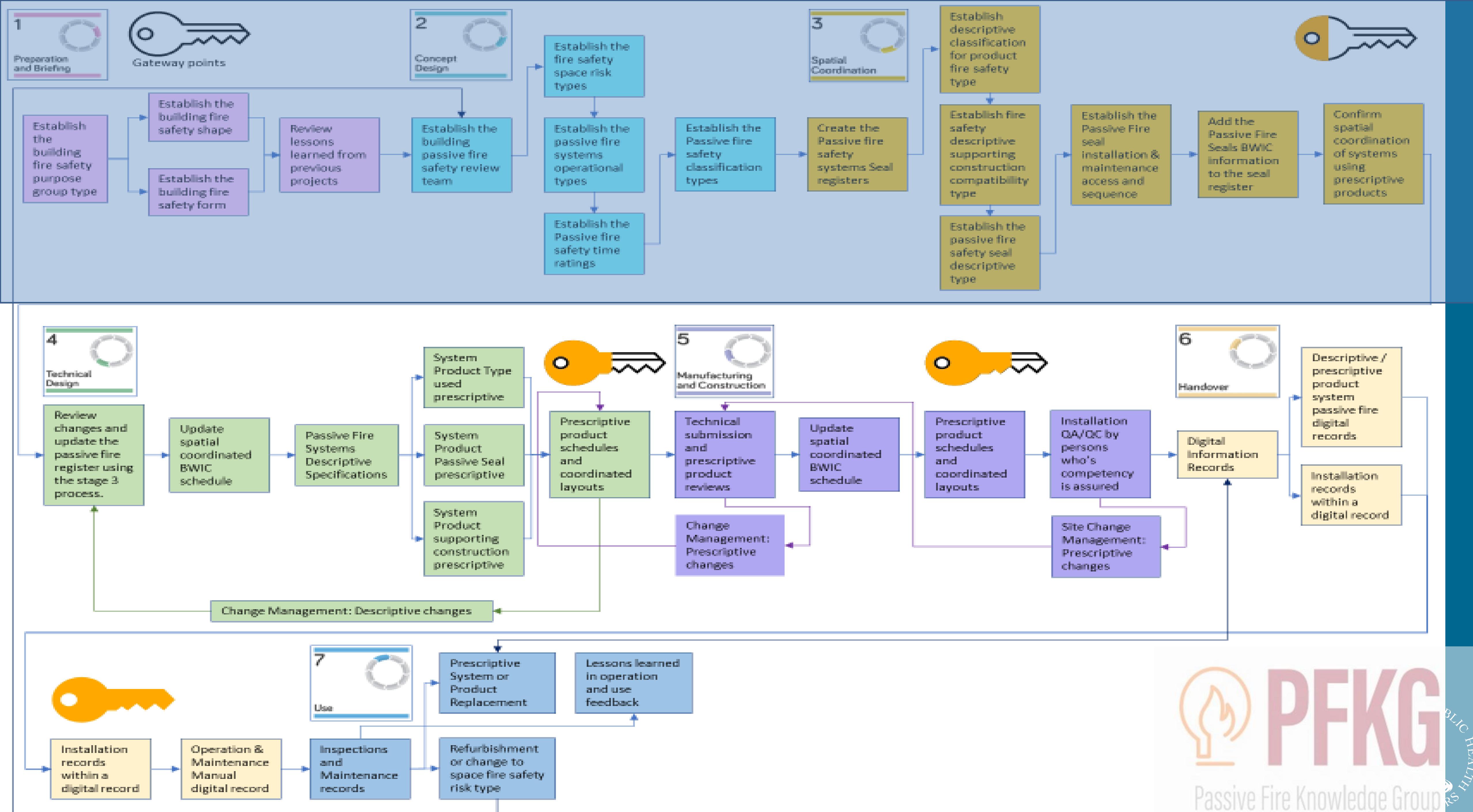
Key Related Standards

- BS EN 1366-3:2021. Fire resistance tests for service installations. Penetration seals
- 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 13501-1:2018. Fire classification of construction products and building elements. Classification using data from reaction to fire tests
- BS EN 15882-3:2009. Extended applications of results from fire resistance tests for service installations. Penetration seals

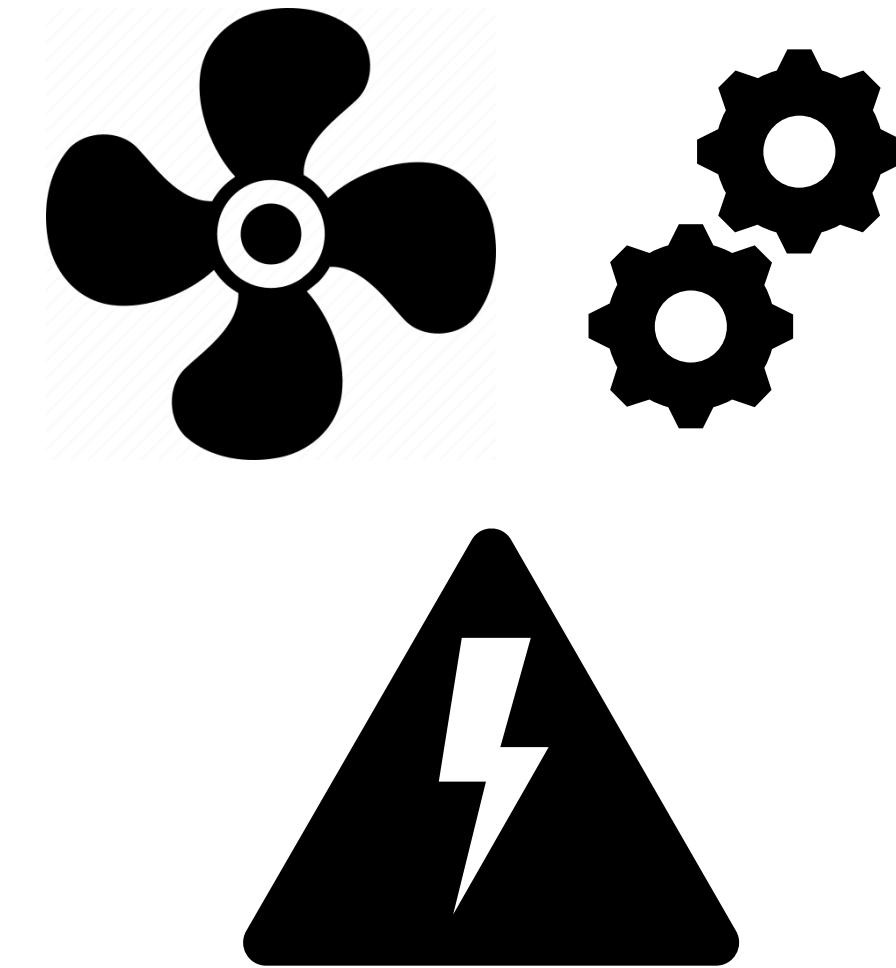
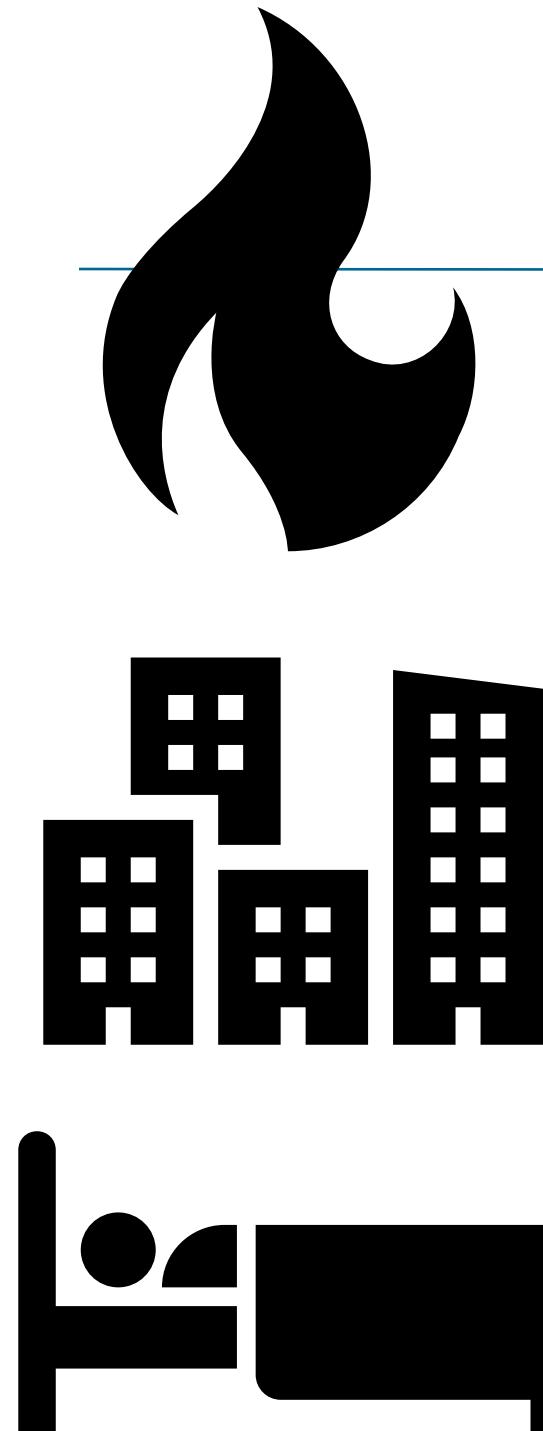
Covers

- Metallic Pipes
- Plastic Pipes
- Metallic Tray work
- Metallic Ladders
- Conduits
- Trunking
- Busbar

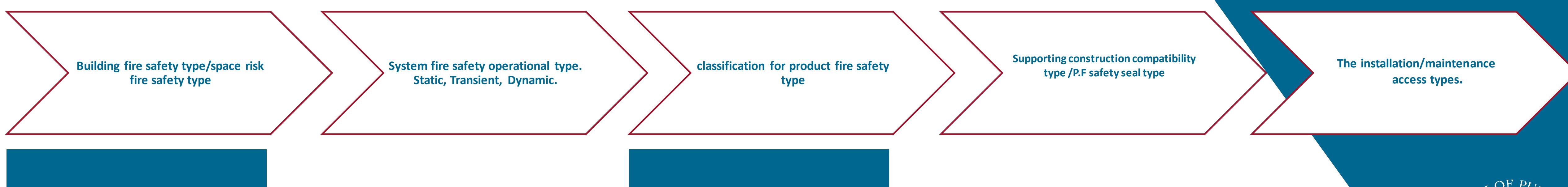
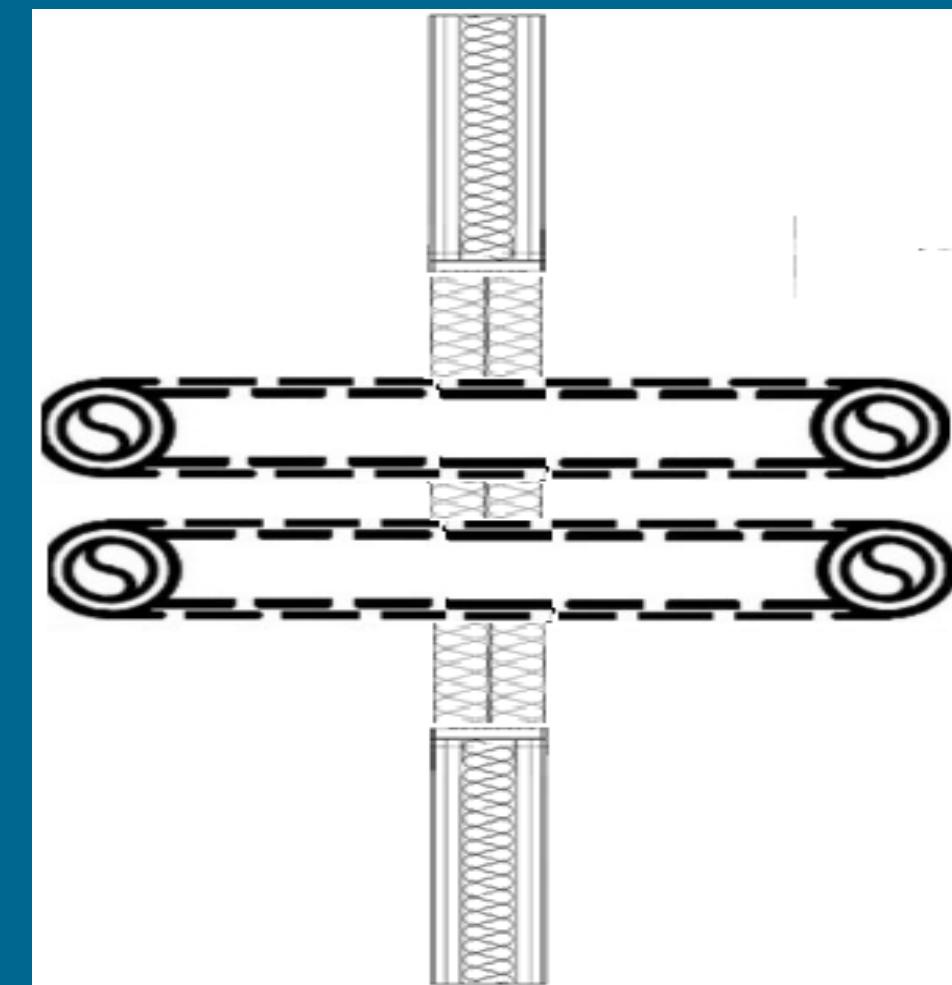
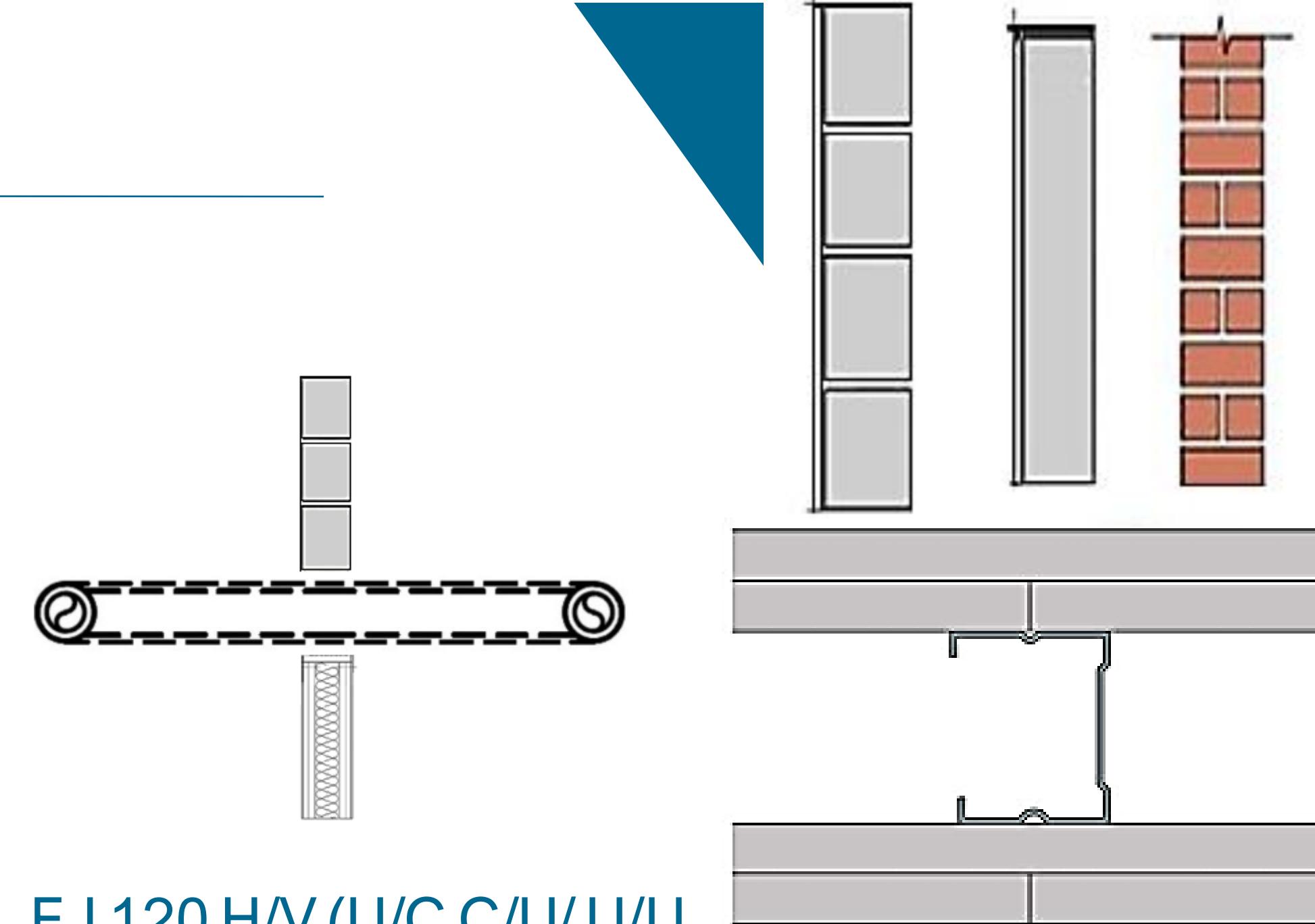
There are different fields for busbar, trunking and conduits



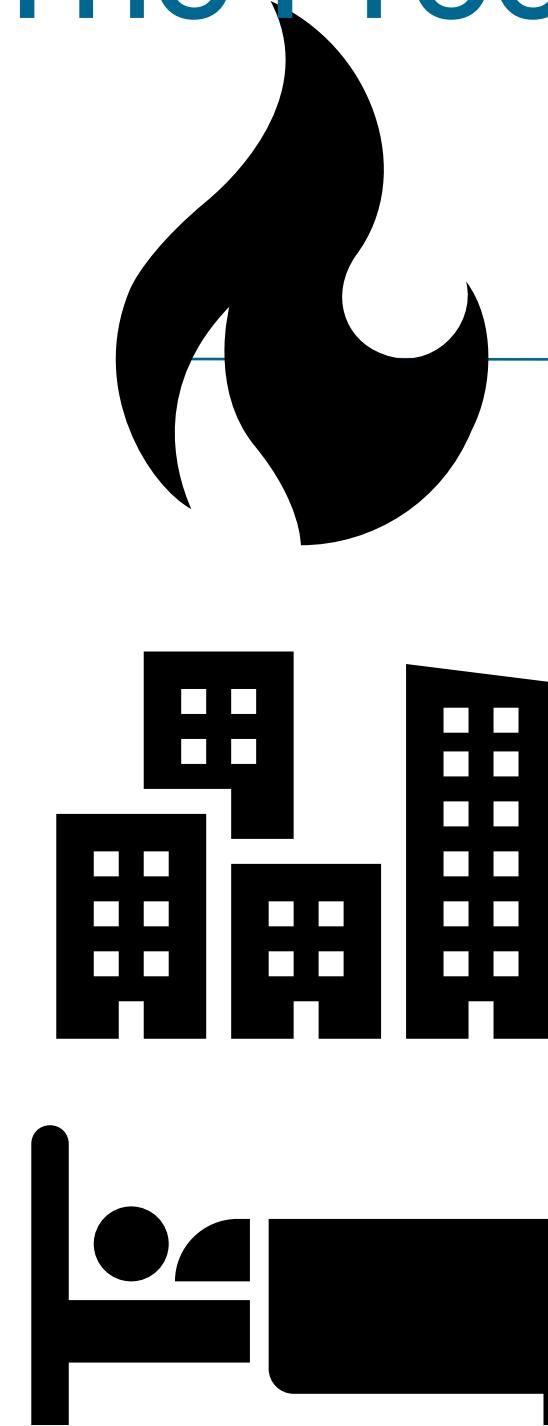
The Process required for descriptive pipework seals



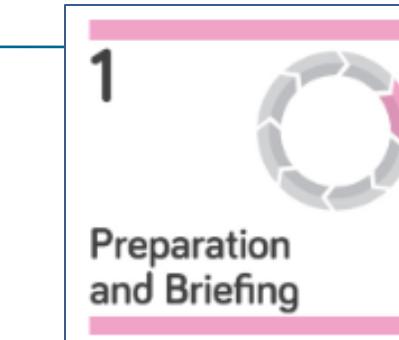
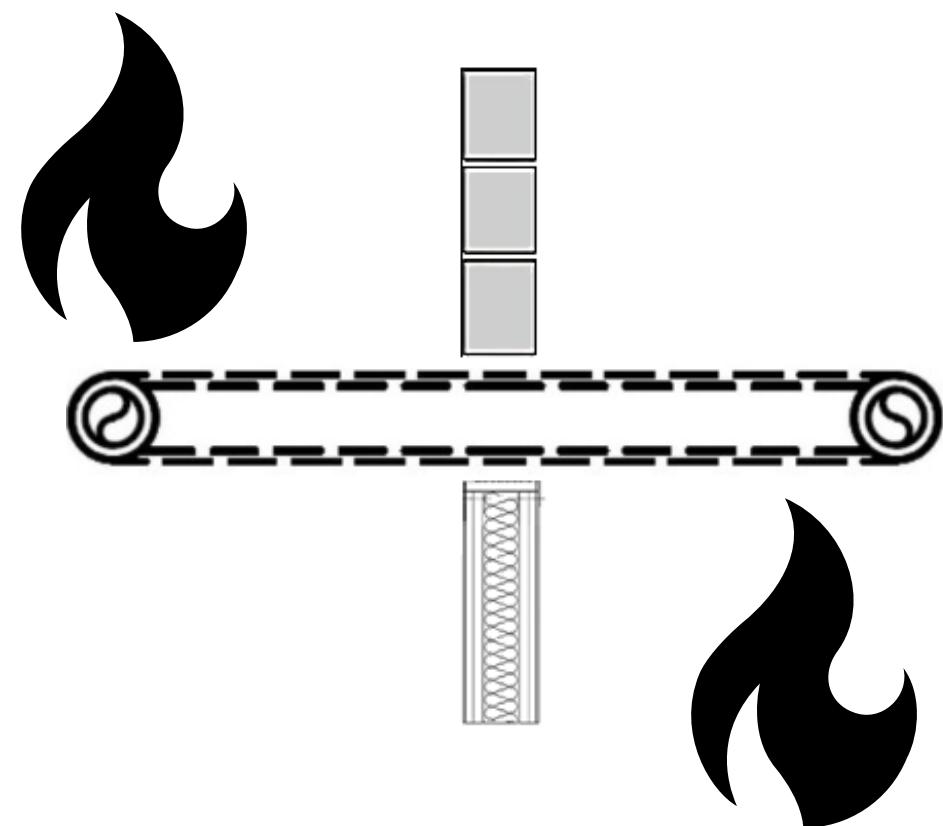
E.I 120 H/V (U/C C/U/ U/U
C/C) (CS, CI, LS, LI)



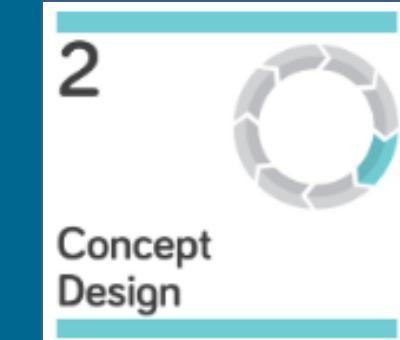
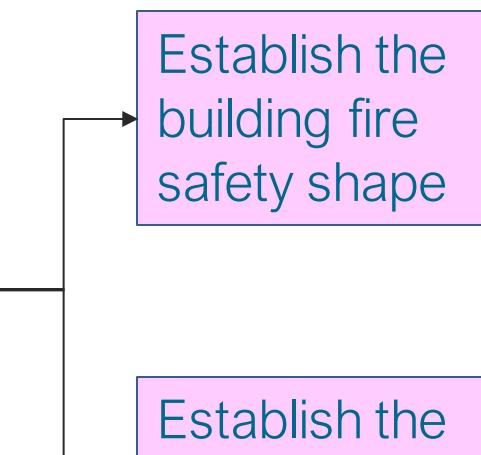
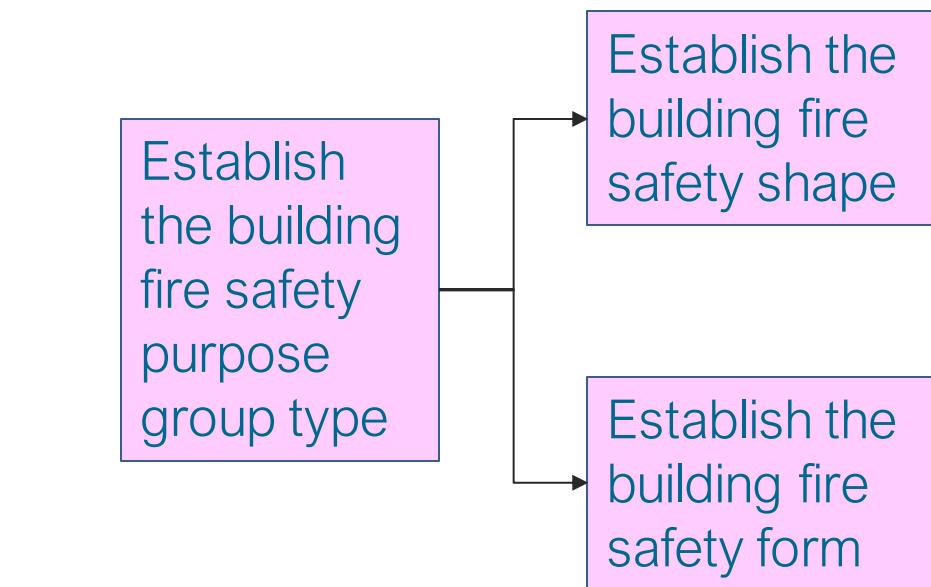
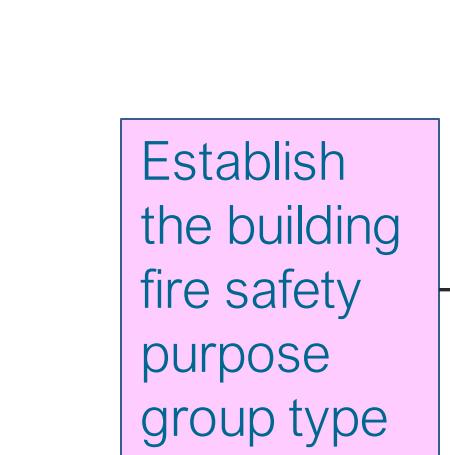
The Process required for descriptive pipe



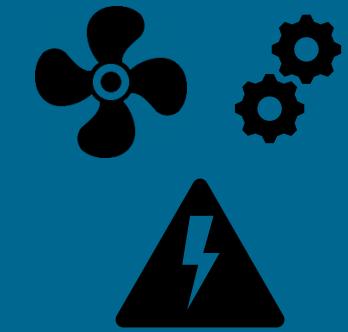
Building fire safety type/space risk fire safety type .



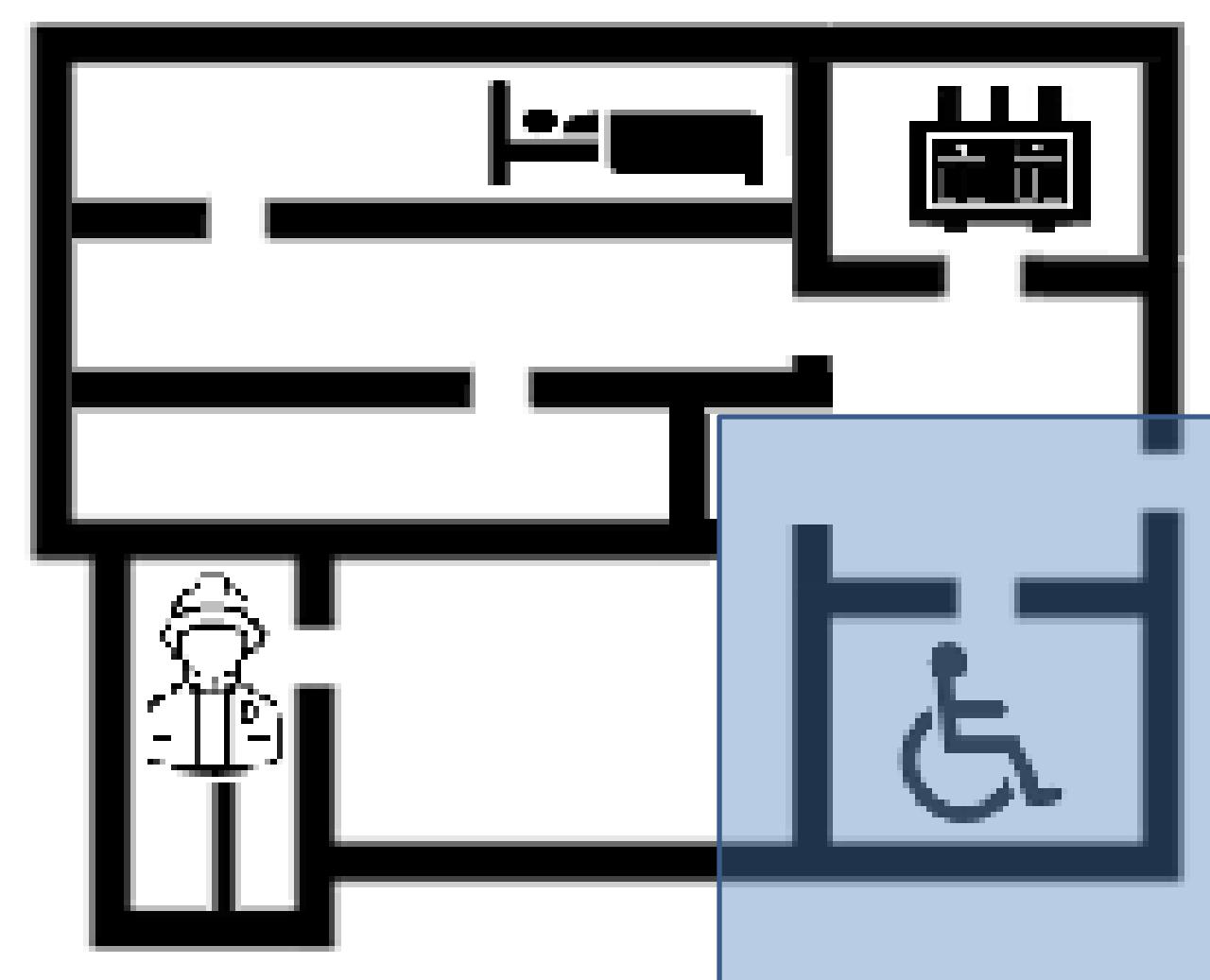
Gateway points



Establish the fire safety space risk types



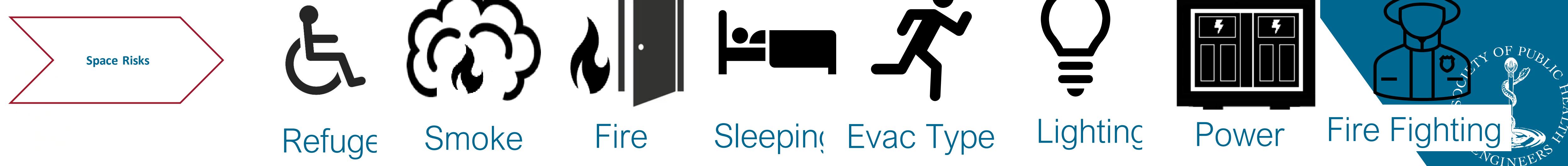
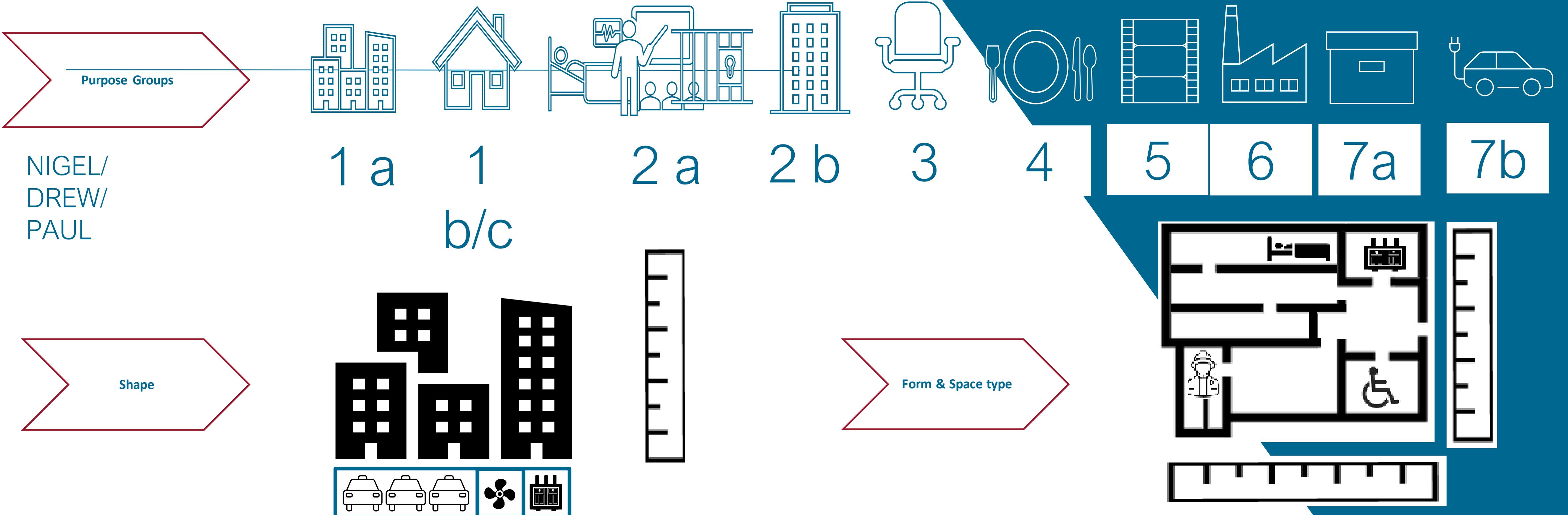
System fire safety operational type. Static, Transient, Dynamic.



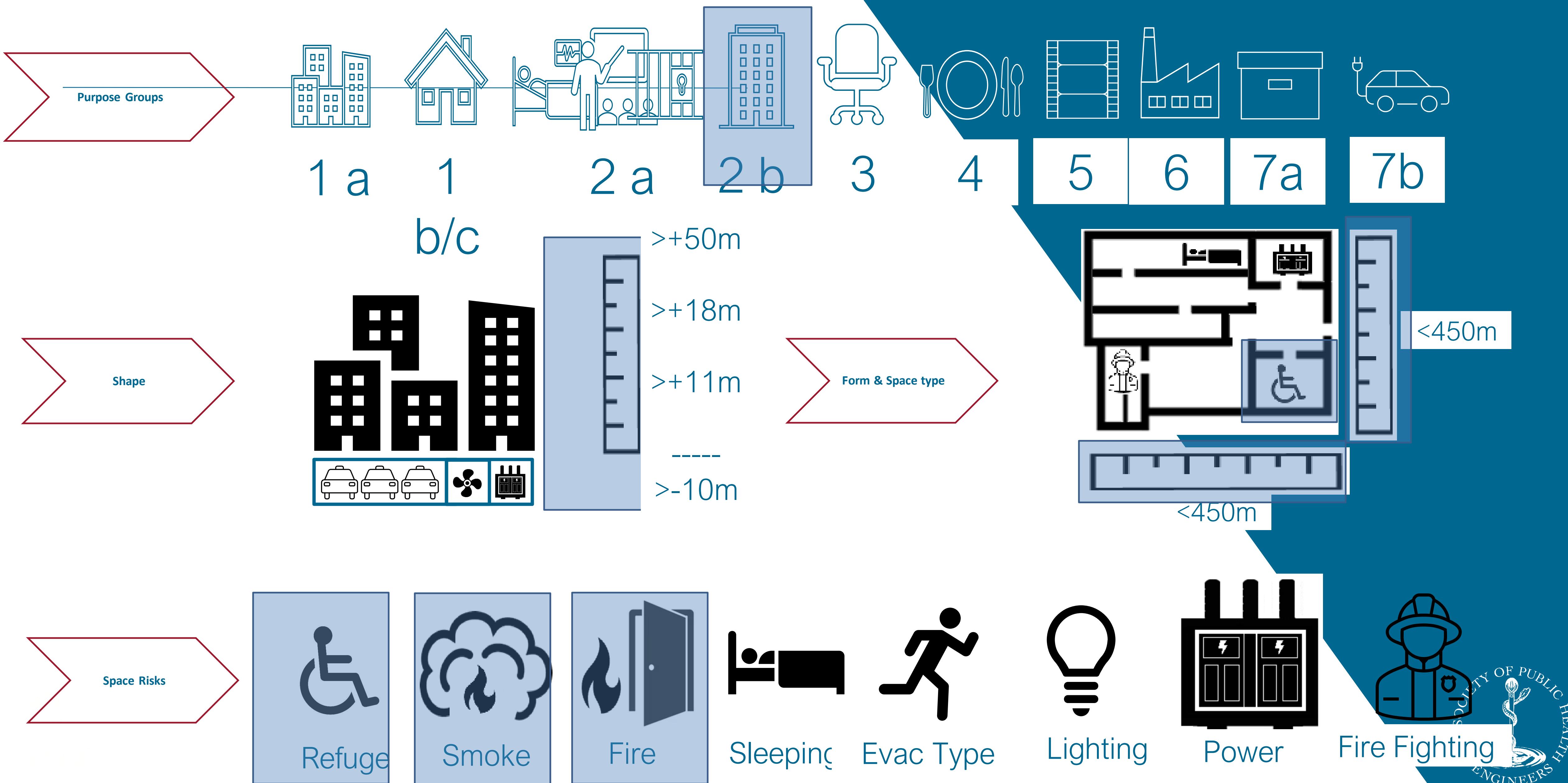
Example:

Refuge in protected corridor with pipe work transition

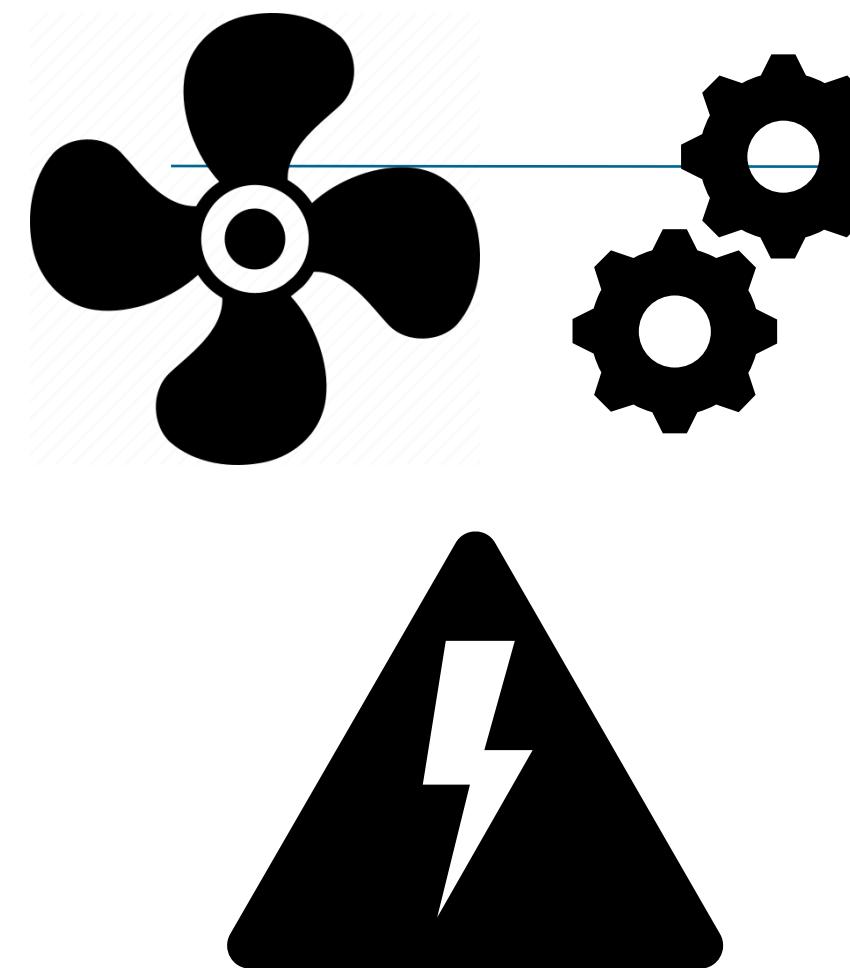
Building fire safety type/space risk fire safety



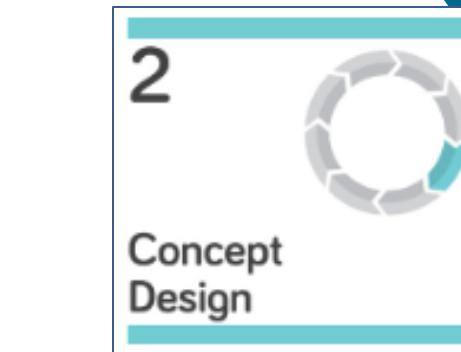
Building fire safety type/space risk fire safe



The Process required for descriptive pipework systems



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



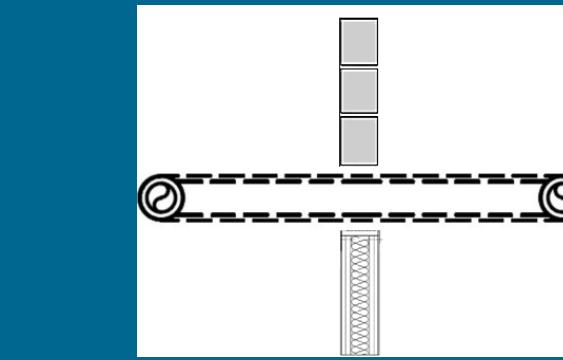
Gateway points



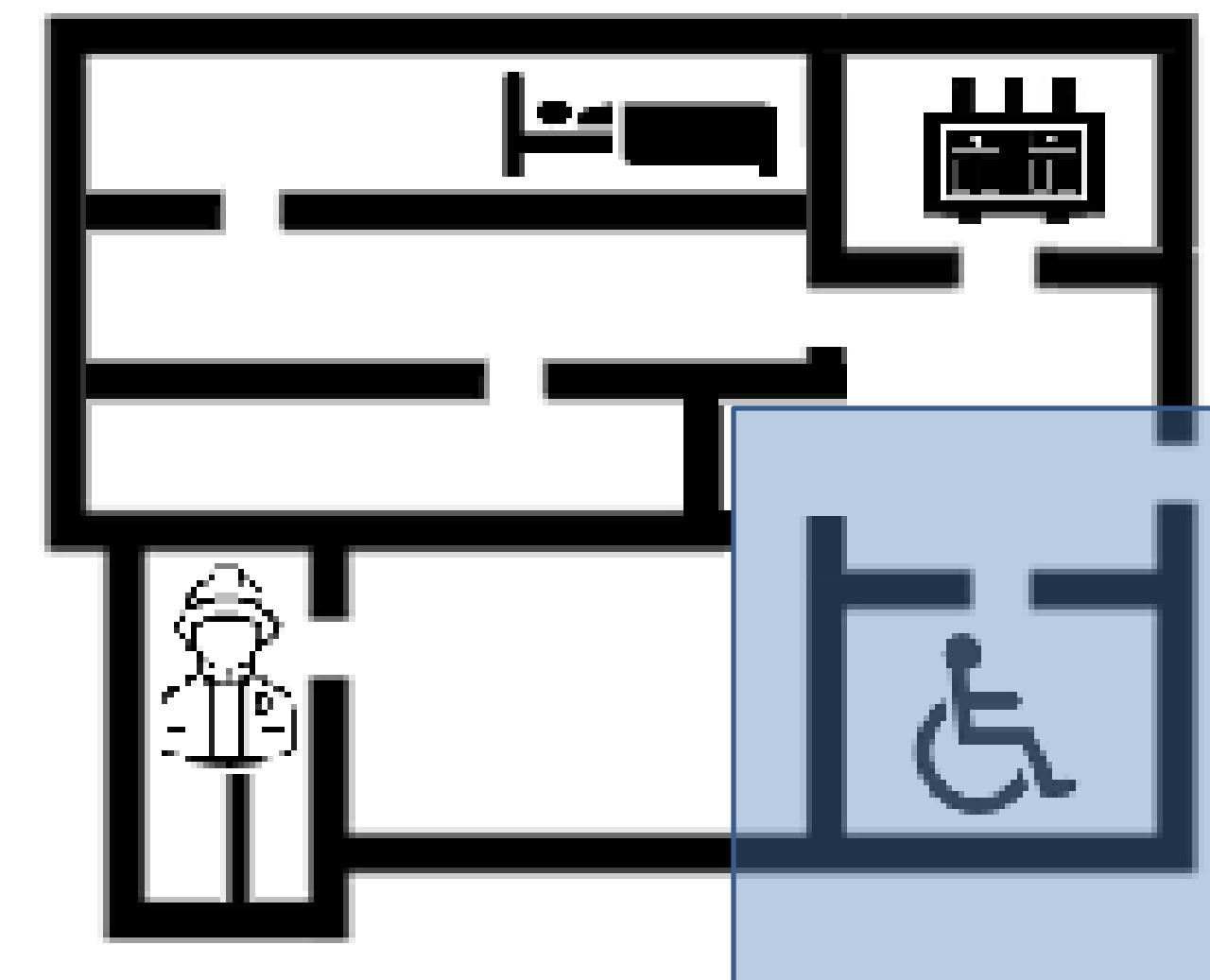
Building fire safety type/space risk fire safety type

Establish the passive fire systems operational types

Establish the Passive fire safety time ratings

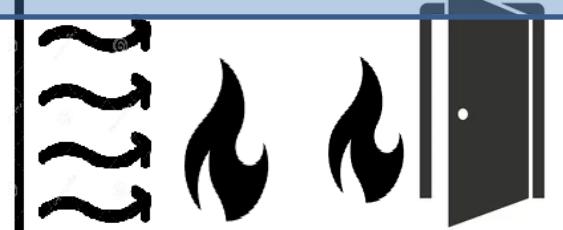
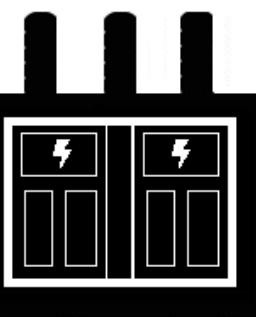


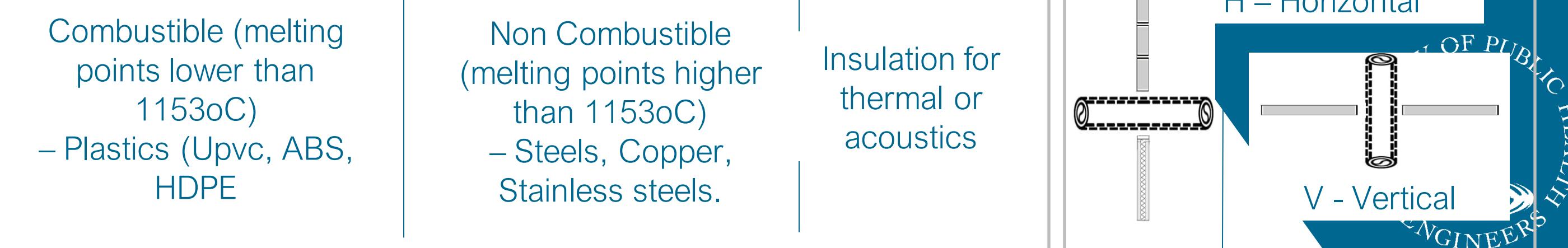
E.I 120 U/C C/U/U/U C/C



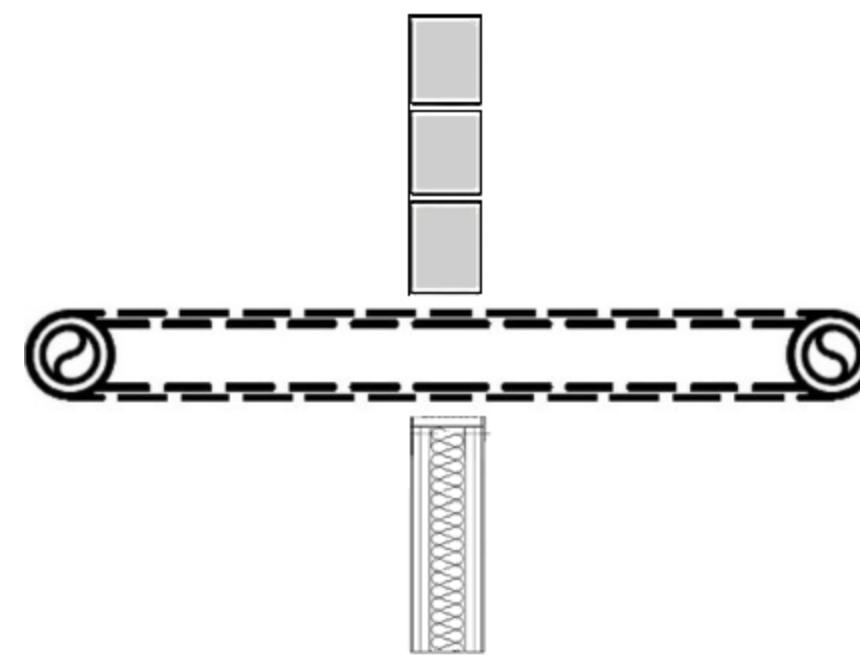
Example:
Refuge in protected corridor with pipe work transition

Building fire safety type/space risk fire safety

Space Type	Risk	Time	Capped/ Un Capped	Material	Fluid Temp oC	Required	Sustained/ interrupted	Plane	Movement mm	
	Protected Corridor or Lobby		30-240 minutes	C/C, U/C, C/U, C/C	Non Combustible/ Combustible	-x to +x	Y/N	CS, CI, LS, LI	H/V	-XX to +XX
	Sleeping, Clinical		30-240 minutes							
	Phased Evacuation		30-240 minutes							
	Simultaneous Evacuation		30-240 minutes							
	Power Critical supplies		30-240 minutes							
	Fire Fighting		30-240 minutes							

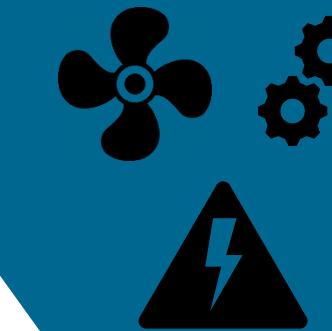
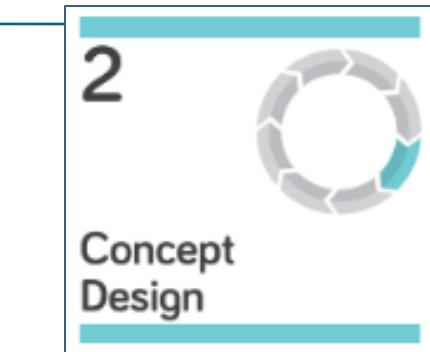


The Process required for descriptive pipework safety



E.I 120 V/H (U/C C/U/
U/U C/C) (CS, CI, LS, LI)

classification for
product fire
safety type



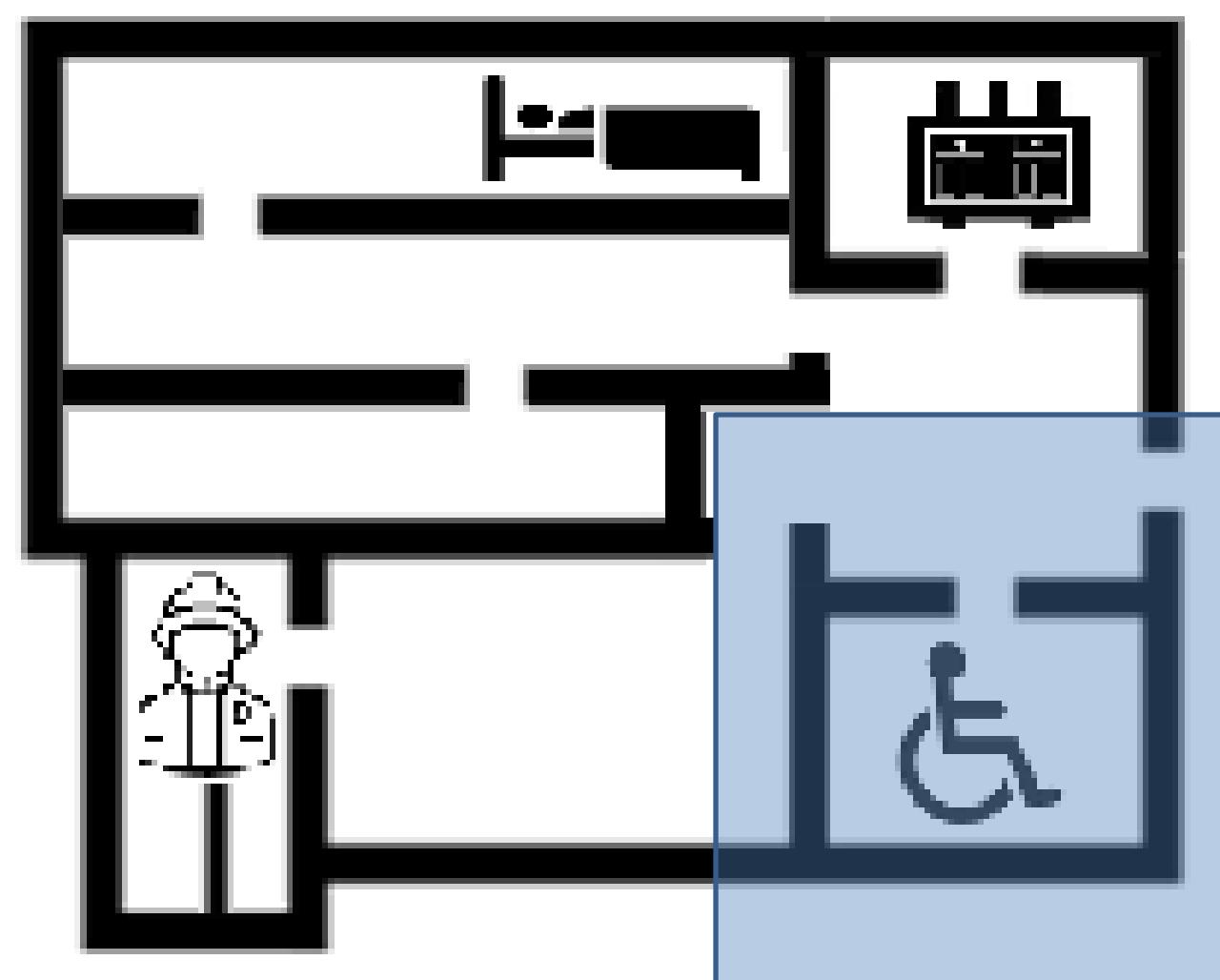
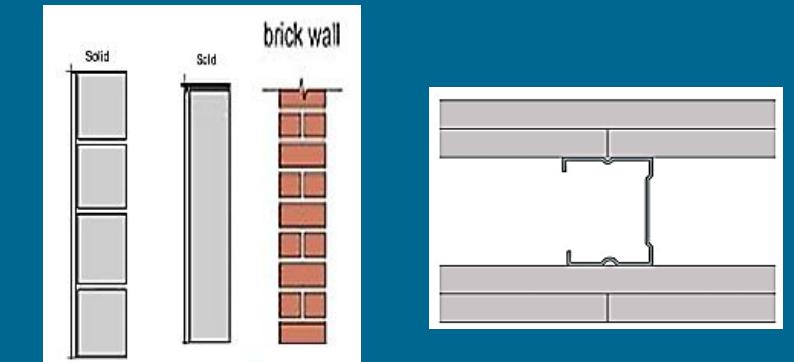
System fire safety
operational type.
Static, Transient,
Dynamic.



Establish the
Passive fire
safety
classification
types

Create the
Passive fire
safety
systems Seal
registers

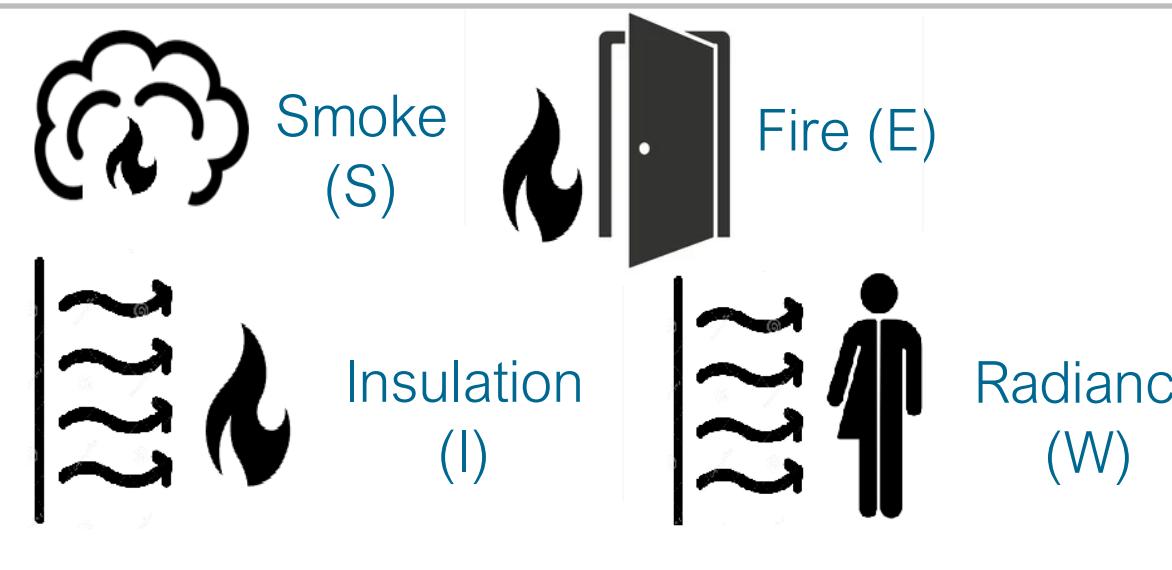
Supporting
construction
compatibility type
/P.F safety seal type



Example:
Refuge in protected corridor with
pipe work transition

Building fire safety type/space risk fire safety type

Space Type	Risk	Time	C/C U/C C/U C/C	Material	OD Size	Wall Size	Fluid Temp oC	Pipe Insulant	Insulant Seal	Plane	Movement mm	Supports from wall	Seal type	
	Protected Corridor or Lobby	E.I	30-240 minutes	C/C	steel	100mm	6.2mm RWP	0-40	CS	Sleeve	H	-25mm +4mm	≤500m	Sleeve
	Sleeping, Clinical		30-240 minutes											
	Phased Evacuation		30-240 minutes											
	Simultaneous Evacuation		30-240 minutes											
	Power Critical supplies		30-240 minutes											
	Fire Fighting		30-240 minutes											

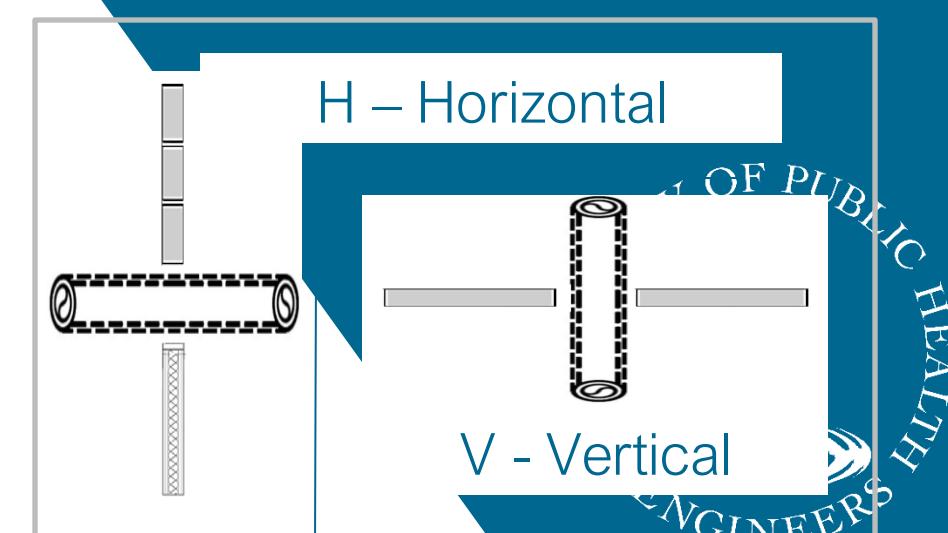


Combustible (melting points lower than 1153oC)
– Plastics (Upvc, ABS, HDPE)

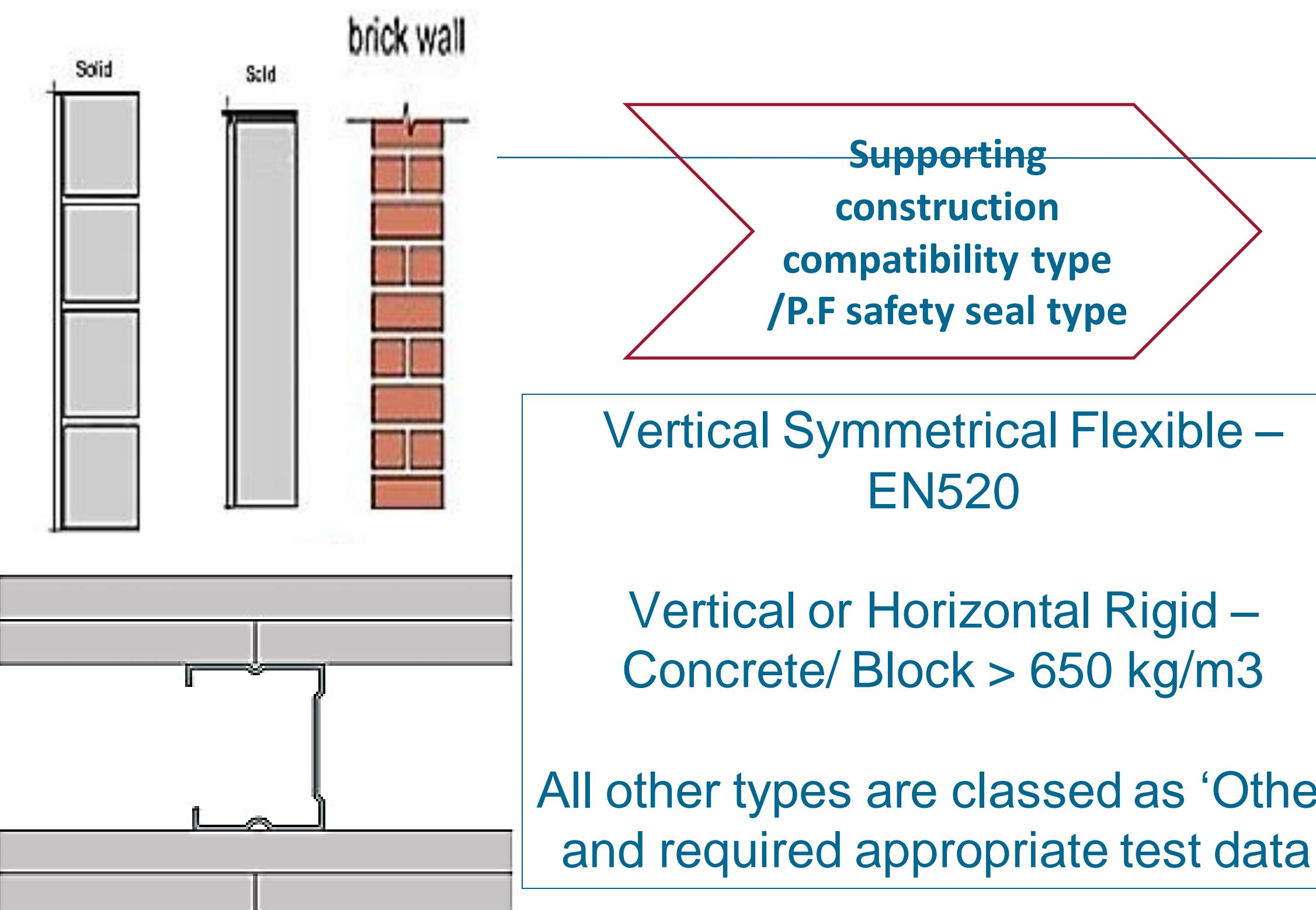
Non Combustible (melting points higher than 1153oC)
– Steels, Copper, Stainless steels.

Pipe Seal Types
Crush Collars
Pipe Wraps
Intu Mastics
Sleeves
Mortar

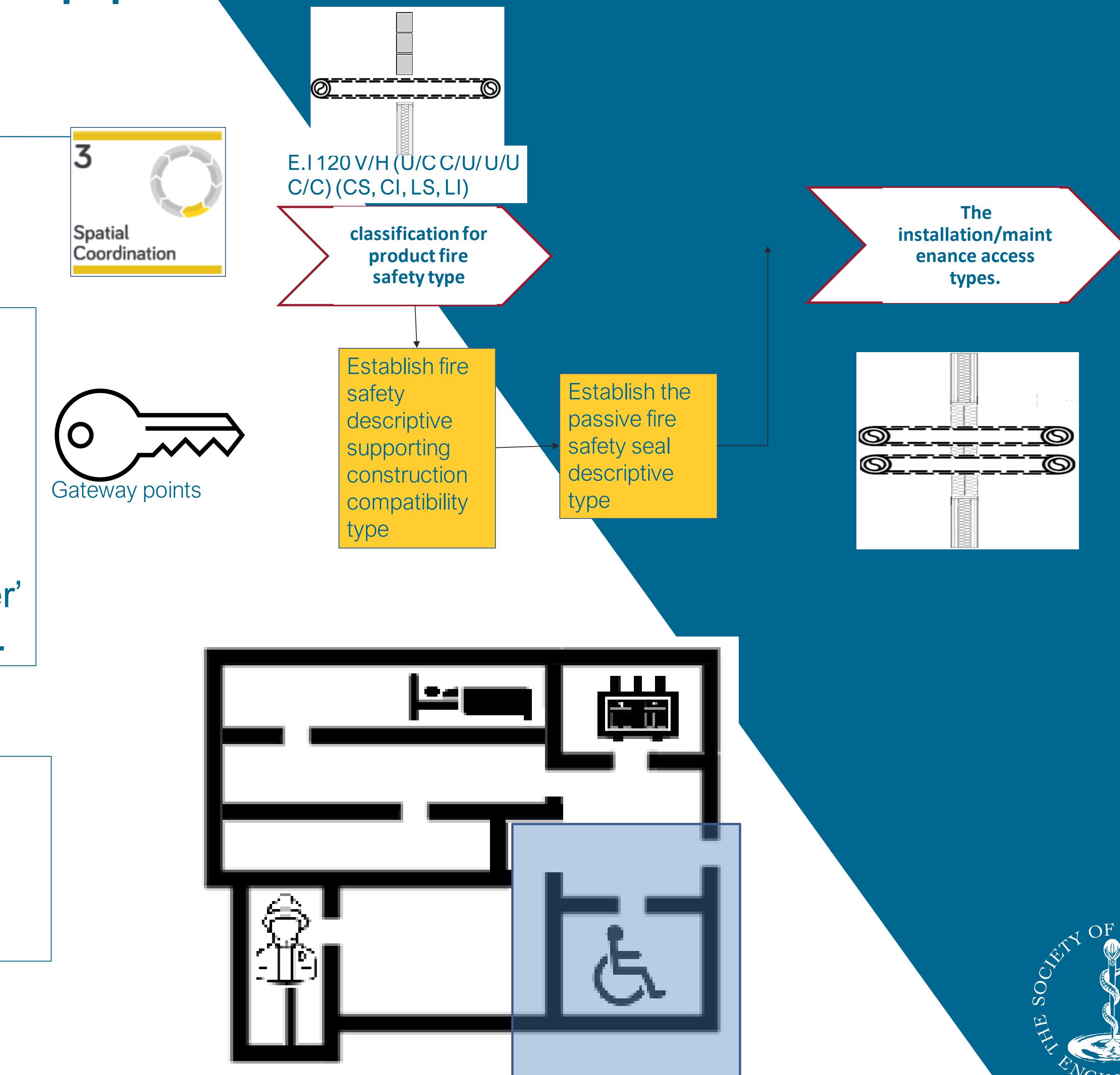
Insulation Seals
Crush Collars
Pipe Wraps
Intu Mastics
Sleeves
Mortar



The Process required for descriptive pipework



Example:
Refuge in protected corridor with pipe work transition



Building fire safety type/space risk fire safety type

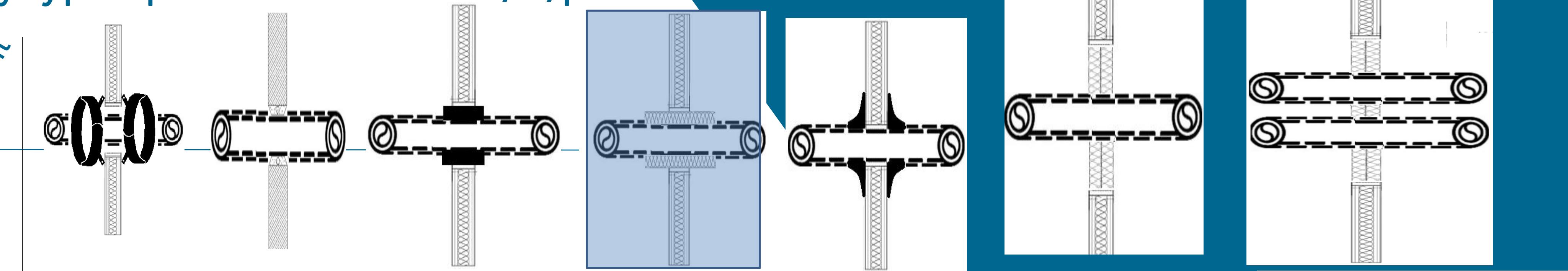
Classification

E.I 120 (H)(C/C)(CS)



Protected
Corridor or
Lobby

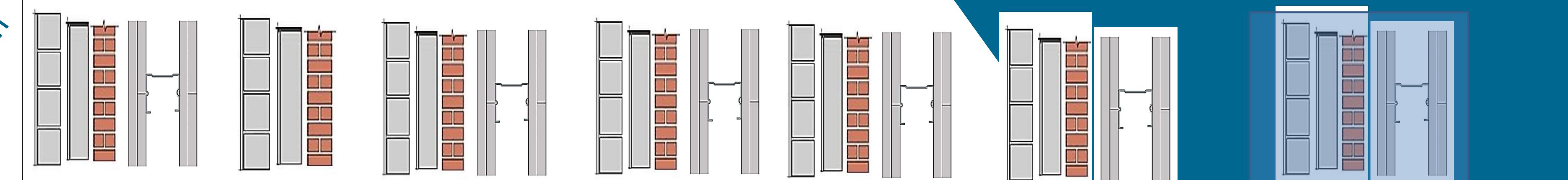
Arrangement
Seal Type



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 manufacturers 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)

Combustible / Non
Combustible

Material
Type

Combustible

Non-
Combustible

Non-Combustible
(insulation only)
& Combustible

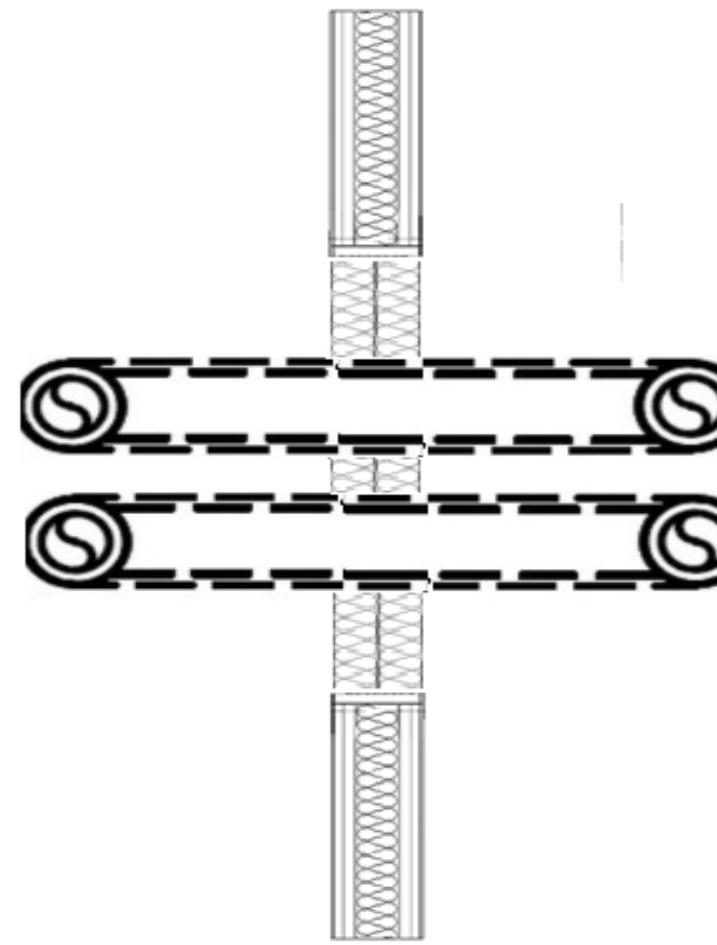
Non-
Combustible

Non-Combustible
(insulation only)
& Combustible

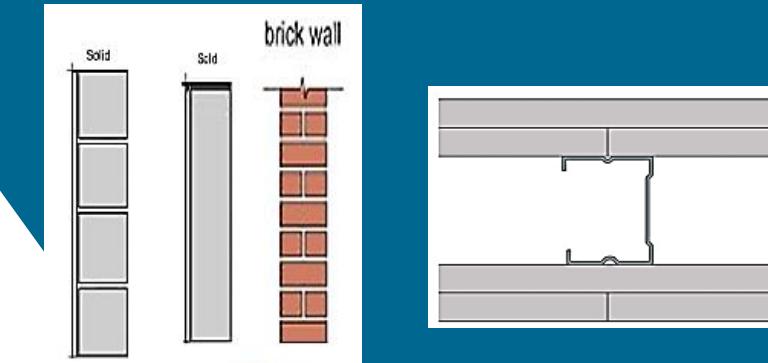
Non-Combustible
& Combustible as
seal type

Non-Combustible
& Combustible as
seal type

The Process required for descriptive pipework seals



The installation/maintenance access types.



Supporting construction compatibility type /P.F safety seal type

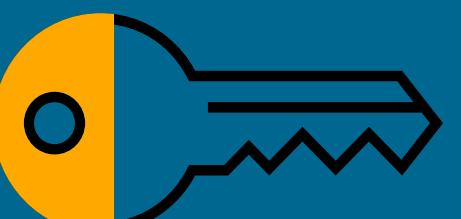
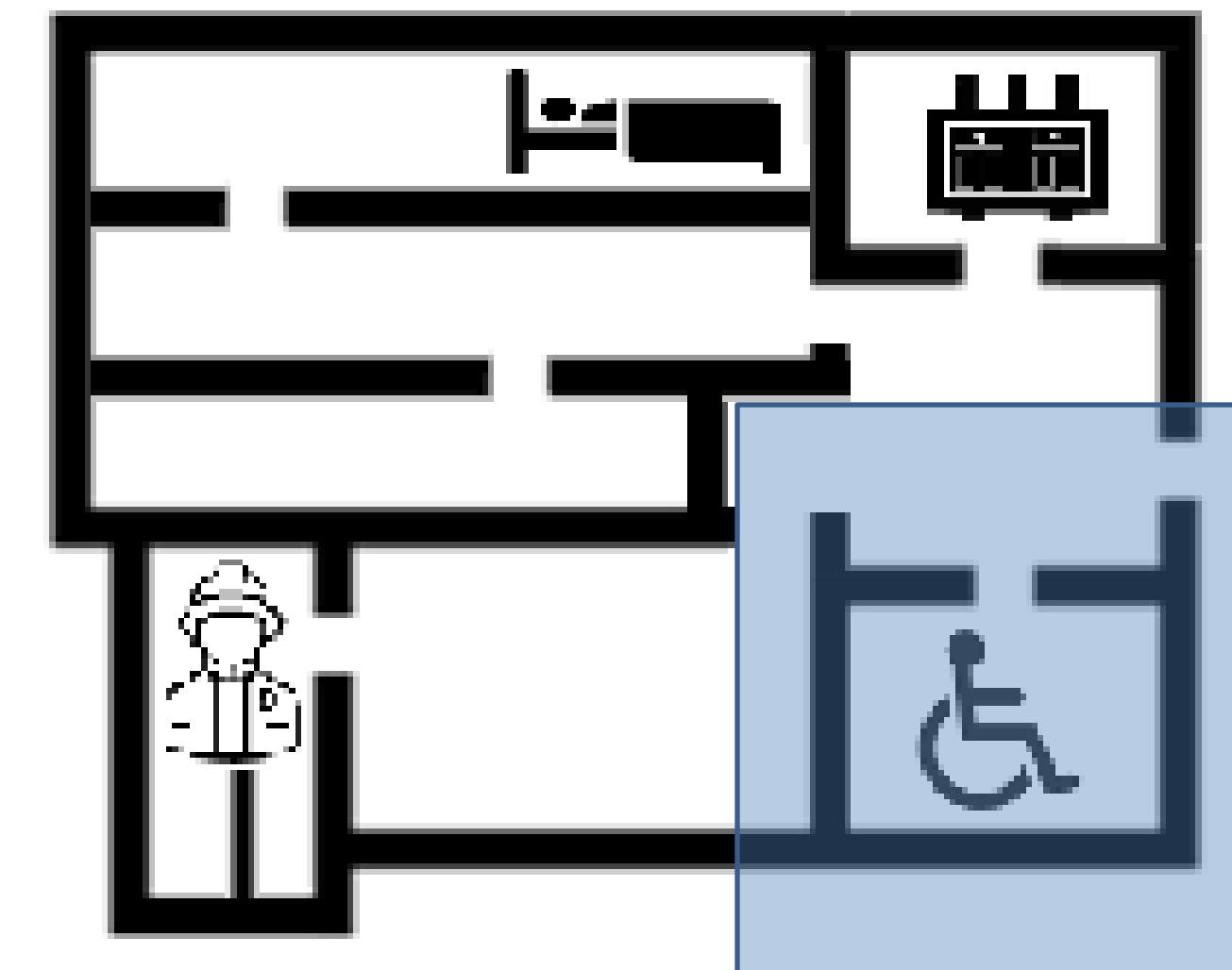


Gateway points

Establish the Passive Fire seal installation & maintenance access and sequence

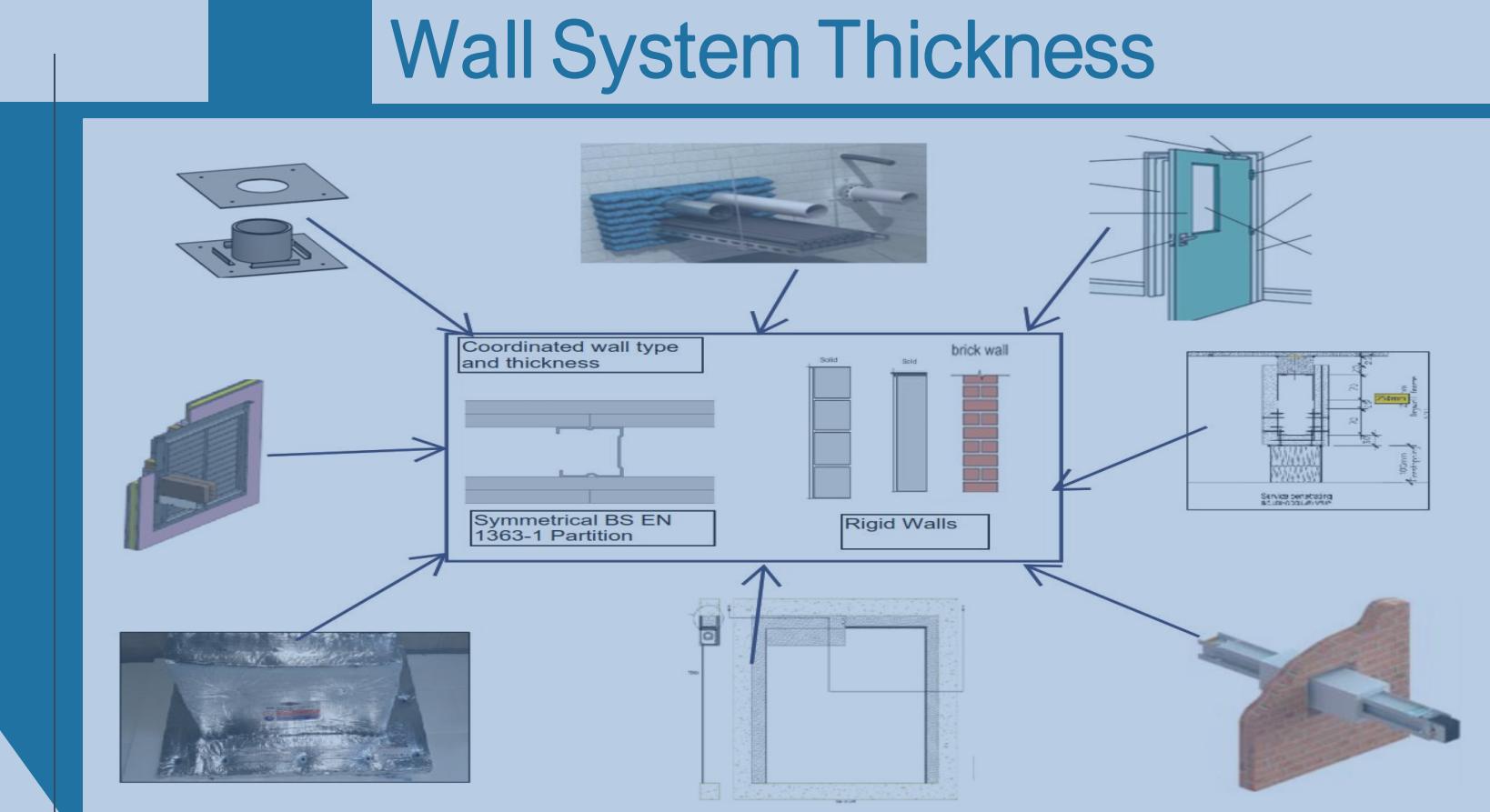
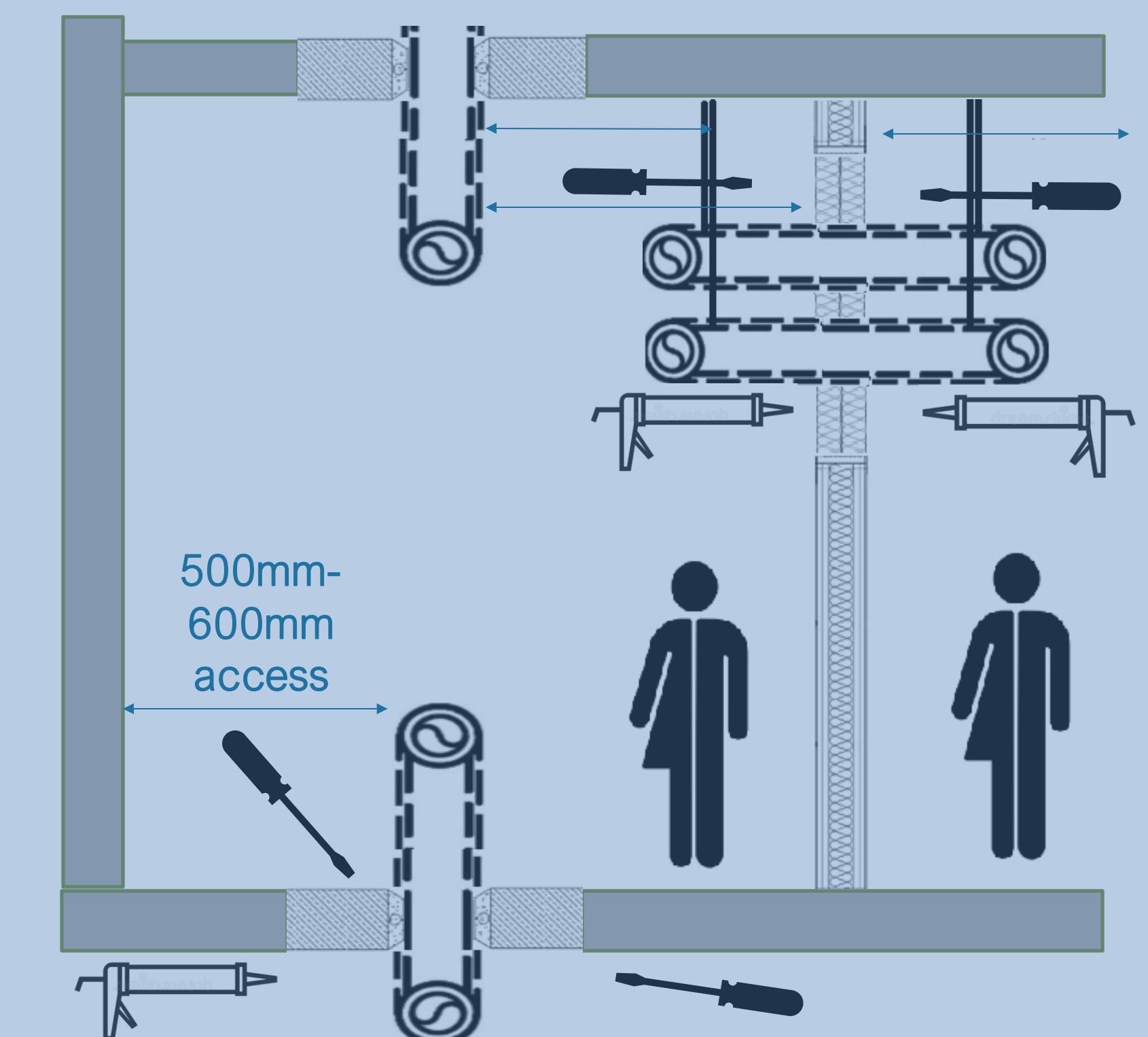
Add the Passive Fire Seals BWIC information to the seal register

Confirm spatial coordination of systems using prescriptive products

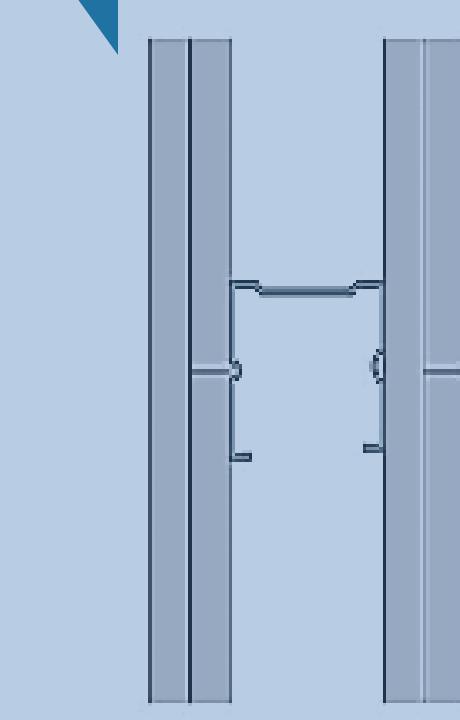
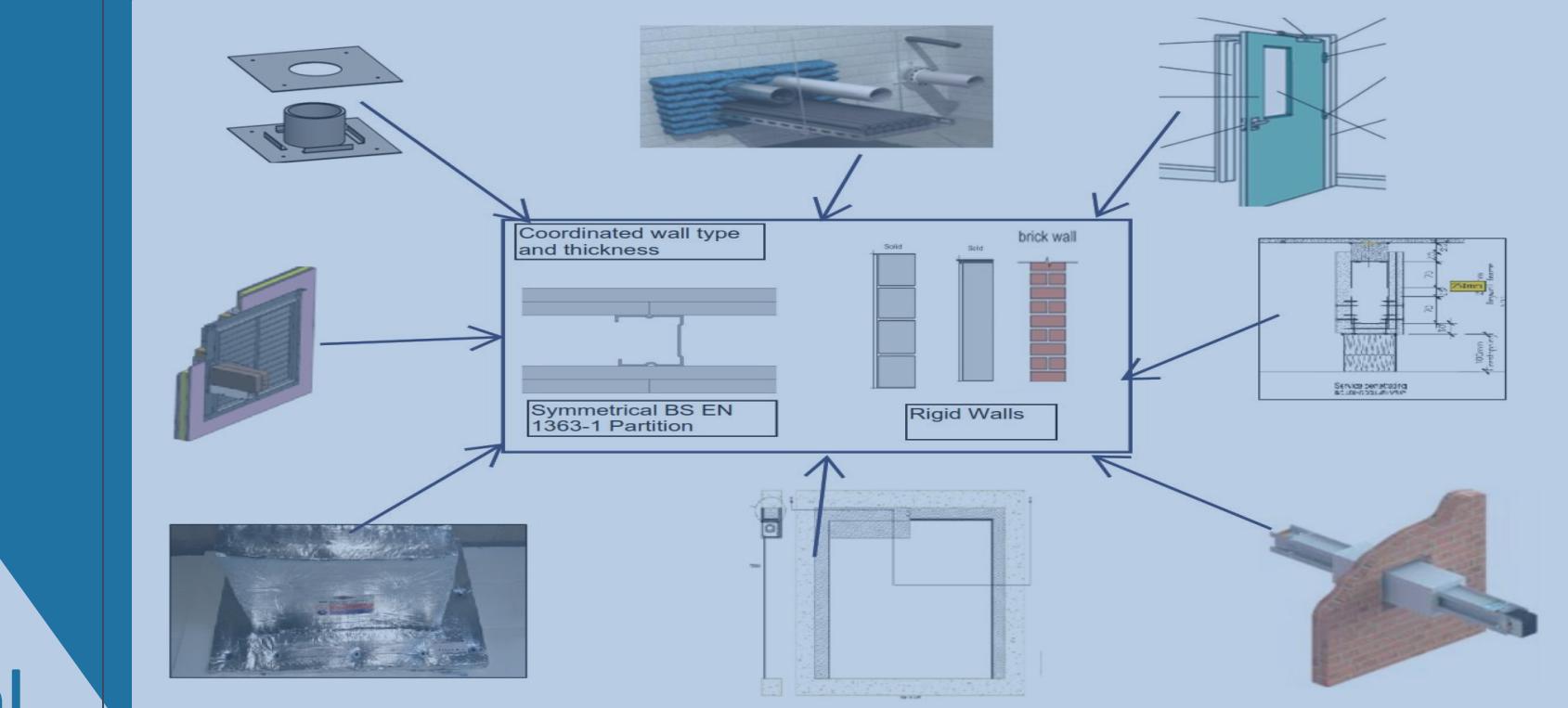
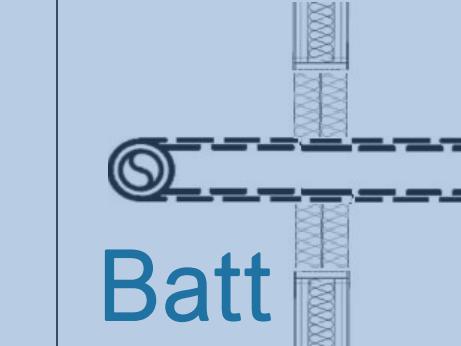


Example:
Refuge in protected corridor with pipe work transition

Building fire safety type/space risk fire safety type

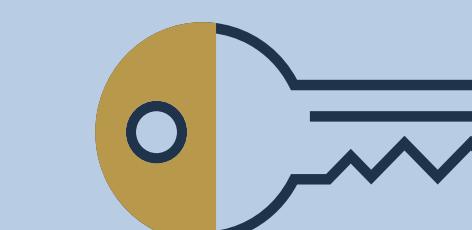
Classification	Material	Size OD	Fluid Temp oC	Wall Position	Wall Type	Wall System Thickness	
E.I 120 (V)(C/C) (CS)  Protected Corridor or Lobby	Non-Combustible	100mm	0oC	H - Horizontal	Symmetrical Flexible – EN520		
Insulation	Arrangement Yes Batt	Seal Type Sleeve	Supports Straight pipe length and support ≤500mm				
<p>Installation Requirements</p> <p>Notes: Anchors to selected BS B539. Where sleeves or mastics touch the pipe surface, ensure that there is no corrosion risk. i.e. CPCV or Stainless Steel (mineral wool)</p> 						<p>* Distance from slab 90-110mm min or distance as required by the fire wall for its tested requirements.</p> <p>** ≤500mm for supports as tested.</p> <p>** ≤500mm for supports as tested.</p> <p>Movement, as determined by review, can not always be accommodated by the seal material and shall be added to the yearly inspections schedule</p>	

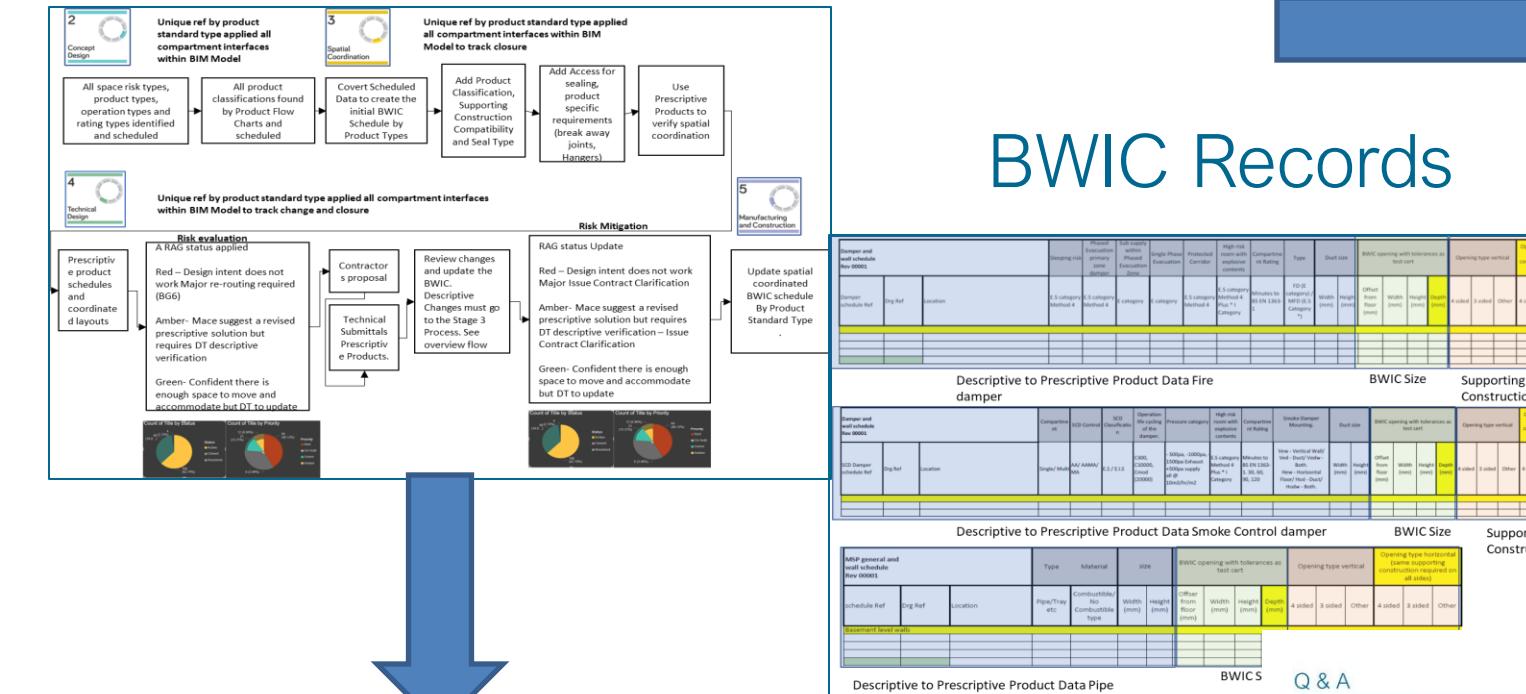
Building fire safety type/space risk fire safety type

Classification	Material	Size OD	Fluid Temp oC	Wall Position	Wall Type	Wall System Thickness
 E.I 120 (V)(C/C) (CS) Protected Corridor or Lobby	Non-Combustible	100mm	0oC	H - Horizontal	 Symmetrical Flexible – EN520	 122mm (example determination)
	Insulation	Arrangement	Seal Type	Supports Straight pipe length and support <500mm		
	Yes	 Batt	 Sleeve			

Classification

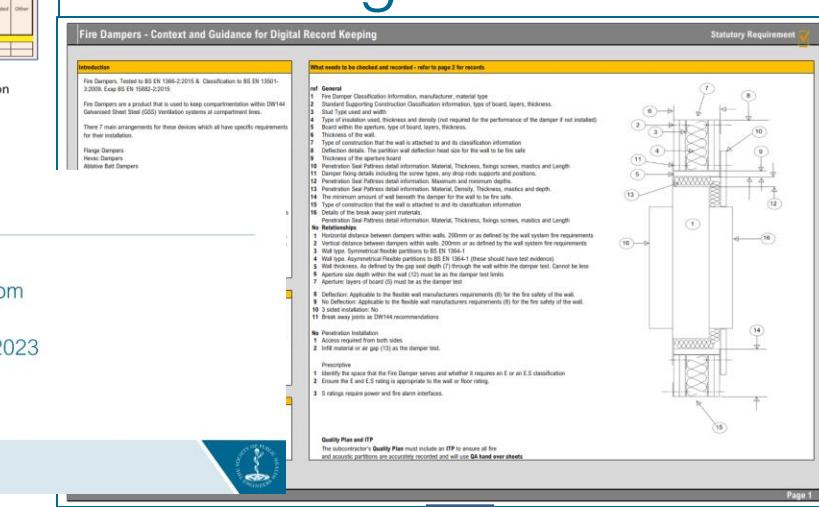
E | I | 120 | H | C/C | CS



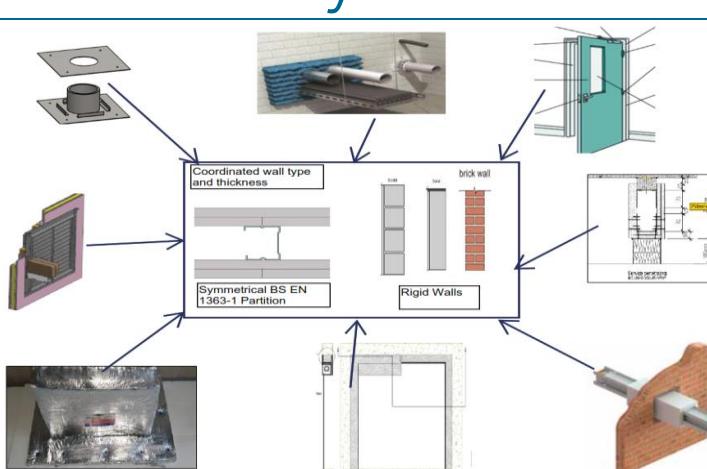
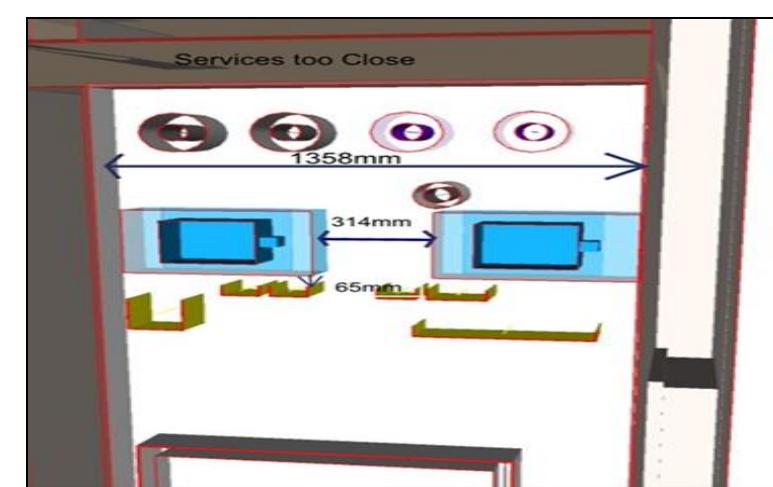


BWIC Records

Installation, Inspection, and Digital Record



Slido.com
#soph2023



Coordination of wall as system



Recorded and location logged

In Use

Q & A

[Slido.com](https://www.slido.com)

#sophe2023