

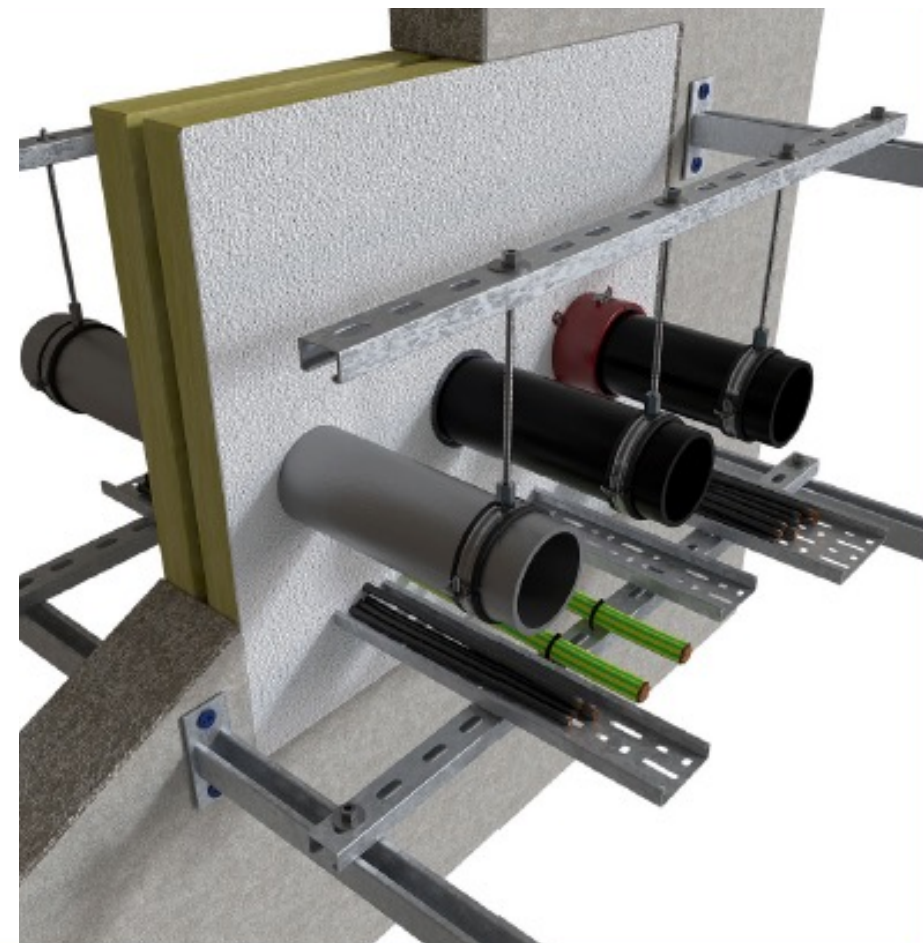


MEP SERVICES PENETRATION SEALS BEST PRACTICE DESIGN AND SPECIFICATION

V1 June 2023

OBJECTIVE

- The objective of this presentation is to 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.



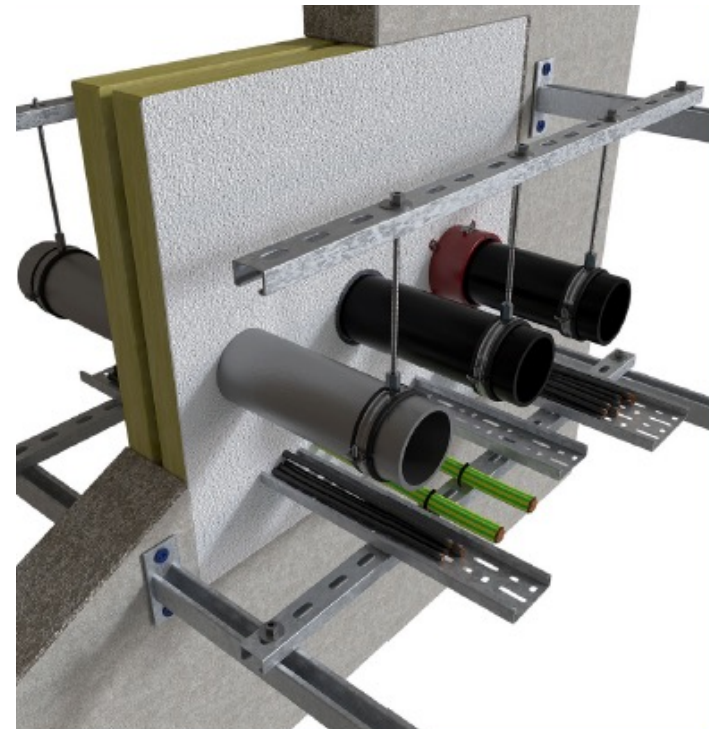
OVERVIEW

- 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



Example fire strategy drawing showing compartmentation layout

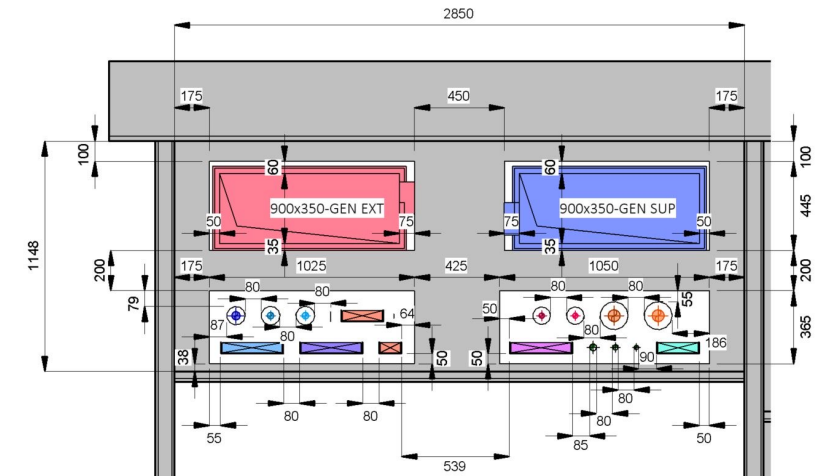


Example mixed-service penetration seal solution



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



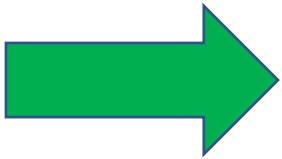
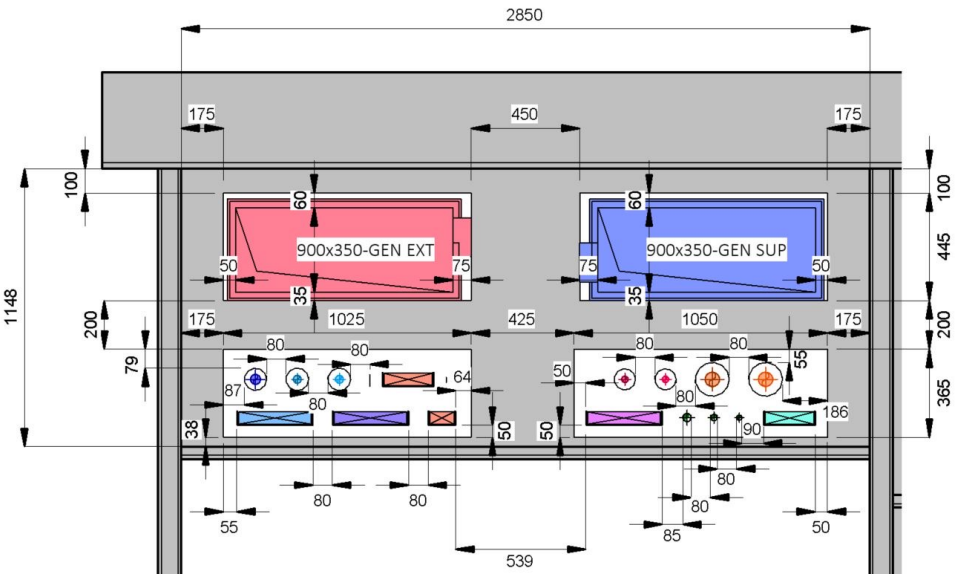
Example showing MEP services spatially planned based on spacing rules

RIBA Stage 3

3



Spatial Coordination



Architectural design / model

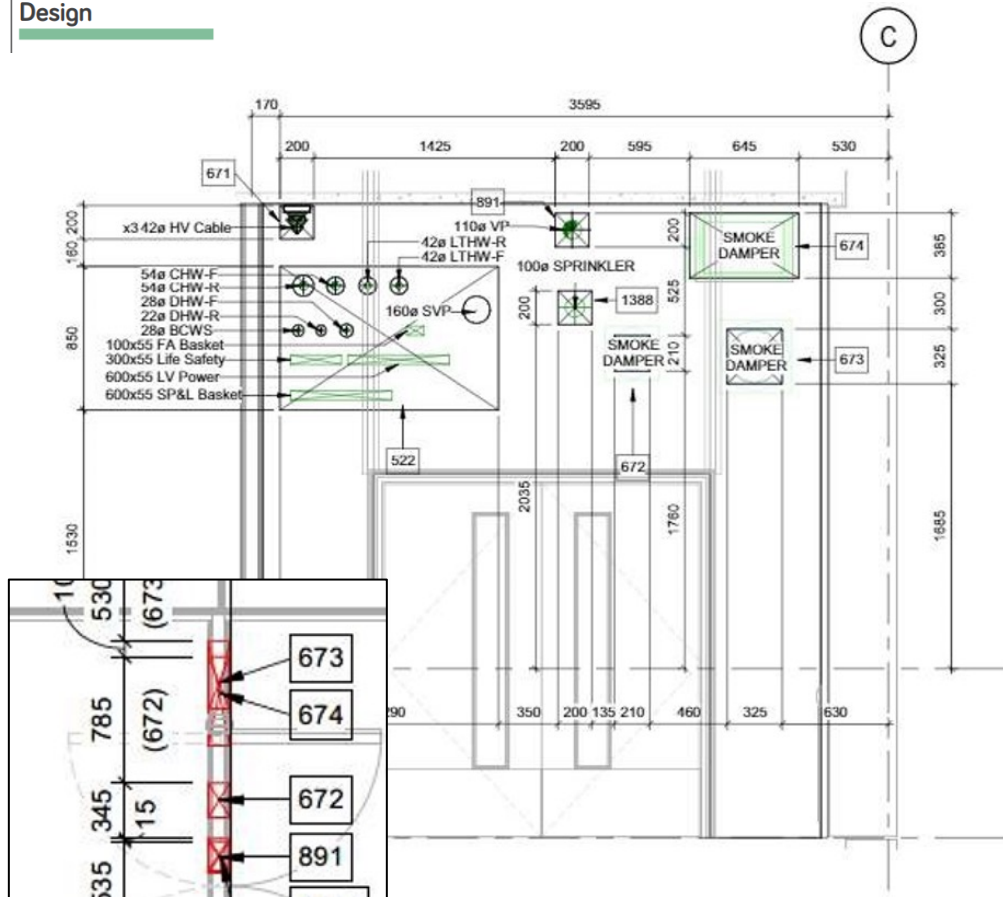
Once the MEP design has been updated to include penetration seal spacing rules, it is essential the architectural design / model is also updated to accommodate additional MEP penetration seal requirements.

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

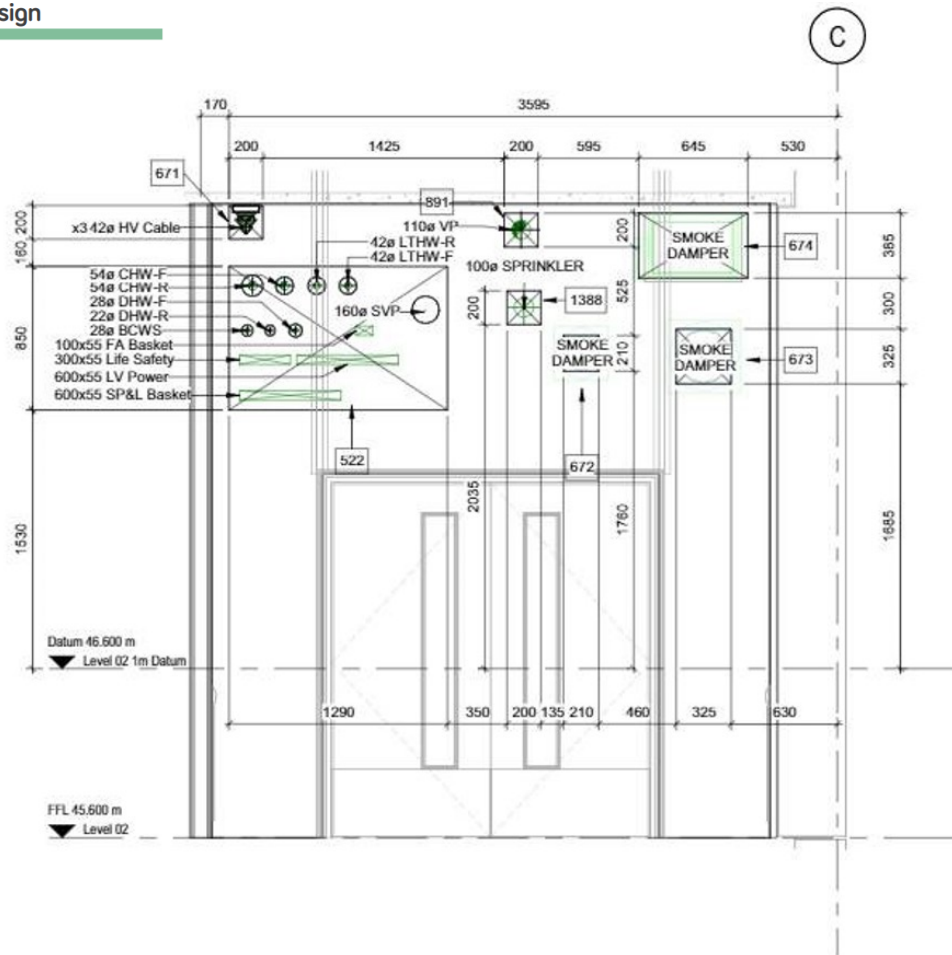
4



Technical Design



Passive Fire Knowledge Group



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



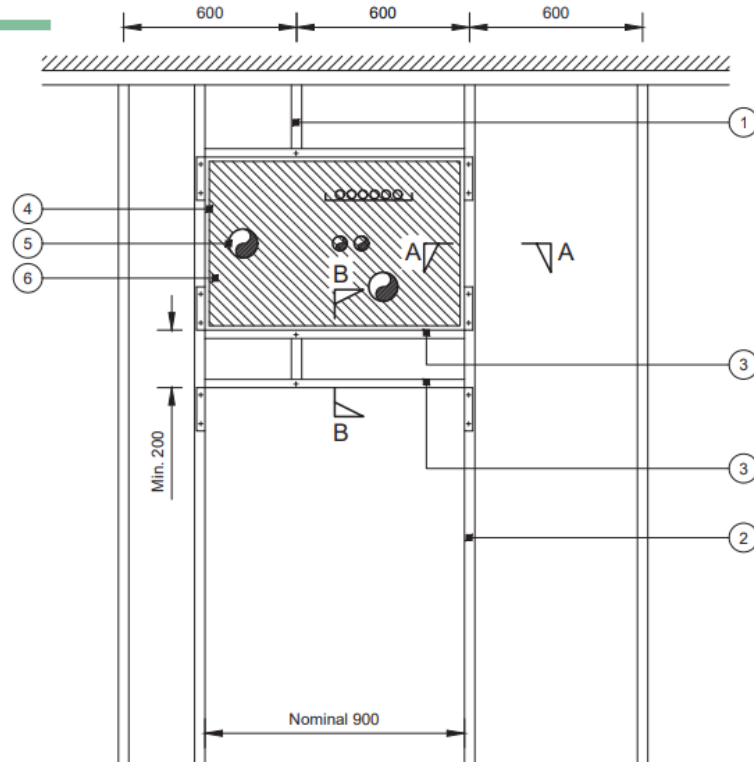
Technical Design



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

RIBA Stage 4



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



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

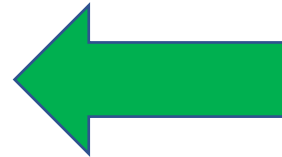
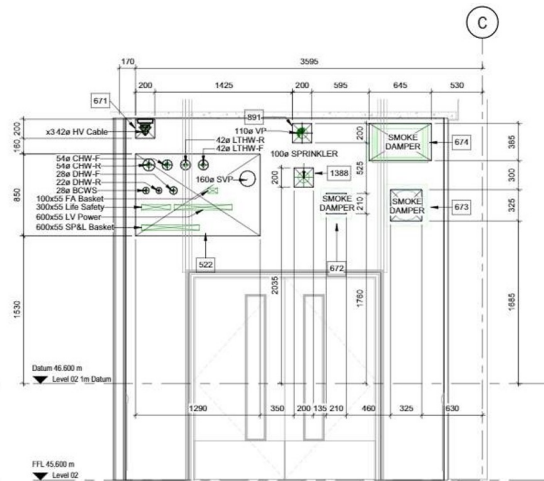
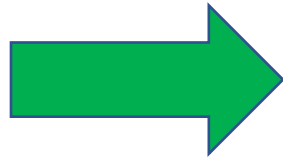
Image courtesy of British Gypsum

RIBA Stage 4

4



Technical Design



MEP design/model updated to include finalised penetration positions



Passive Fire Knowledge Group

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

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).

Reference		Wall Type & Certificates											
Area Reference	BWIC Opening	CHT Reference number	Services Sizes & Material	Service Material	Opening Height mm	Opening Width mm	Offset from Datum mm	Area m ²	Wall Type & Build-Up (Construction type)	Wall/Floor Thickness mm	Fire Designation #	Acoustic Designation dB Rw	Integrity / Insulation
Example	VL-L09	1	100mm diameter HDPE	Substr HDPE Pipe	120	600	2050	0.073	Plasterboard Partition - Type 01	100	F30I20	47dB	120M20

Example of typical penetration seal schedule

RIBA Stage 4

4



Technical Design

Reference		Wall Type & Certificates											
Area Reference	BWIC Opening CMT Reference number	Services Sizes & Material	Service Material	Opening Height mm	Opening Width mm	Offset from Datum mm	Area m ²	Wall Type & Build-Up (Construction type)	Wall/Floor Thickness mm	Fire Designation F _h	Acoustic Designation dB Rw	Integrity / Insulation	
Example	VL-L09	1	100mm diameter HDPE	Sealed HDPE Pipe	150	600	2050	0.079	Plasterboard Plankton - Type B1	150	FPR20	47dB	30W120

Example of typical penetration seal schedule

Fire stop specifier

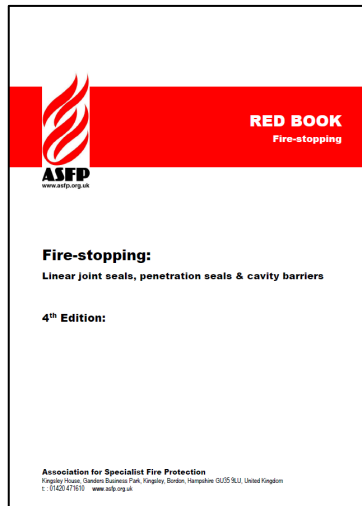
- Penetration seal specifier allocates manufacturer tested or certified penetration seal details to individual apertures along with references to and including supporting information (e.g., ETA documents, classification report etc.)

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

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.

Information is produced by subject matter experts, peer reviewed and signed off by the PFKG Governance group before publication.

All information contained on the PFKG website and its publications, video libraries, and training resources is for general information and guidance only and does not purport to be and should not be considered as a professional or legal advice. Whilst all reasonable steps have been taken to ensure that the information contained on the PFKG website and within its publications is correct to the best of our knowledge, complete accuracy cannot be guaranteed, and the information contained within it may be incomplete or may be due for updates or changes.

Accordingly, the PFKG, its subject matter experts, and the co-publishers make no warranties or representations of any kind as to the content or accuracy of its information and, to the maximum extent permitted by law, accept no liability whatsoever for the same including, without limit, any technical, editorial, typographical or other errors or omissions in or misinterpretations of the information provided on their website, and for direct, indirect or consequential loss, business interruption, loss of business opportunity, loss of profits, production, contracts, goodwill or anticipated savings.

Any person making use of the PFKG's information does so at his or her own risk and it is recommended that they seek professional advice whenever appropriate.

In no event will the PFKG, its subject matter experts, and its co-publishers be liable to anyone for any decision made or action taken in reliance on the information published on the PFKG website or for any consequential, special, or similar damages, even if advised of the possibility of such damages.