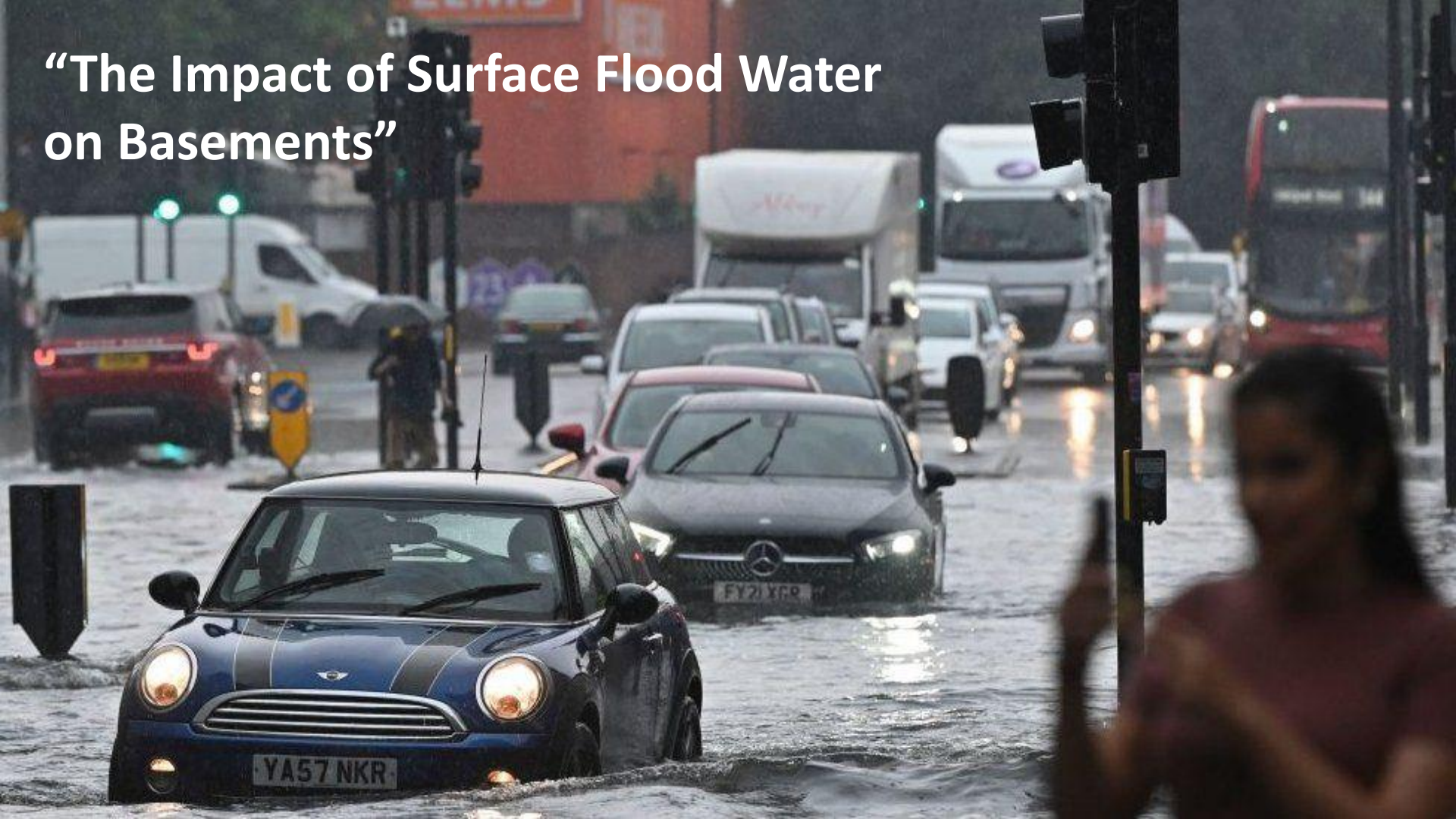
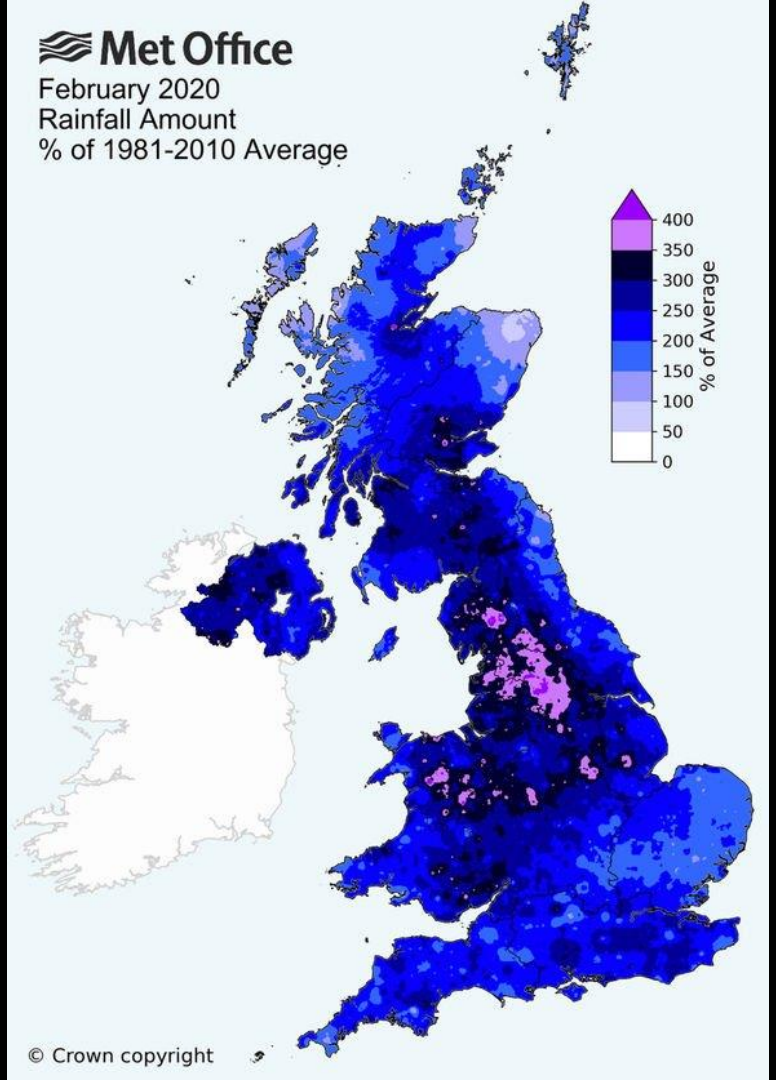
“The Impact of Surface Flood Water on Basements”



Surface water flooding (pluvial flooding) occurs when the ground is over-saturated and/or existing drainage systems are overwhelmed, and the excess water cannot be absorbed or drained away. Pluvial flooding can be caused by sustained rainfall or quick, heavy rainfall that cannot be absorbed quicky enough.

Simply put, the rainwater water has nowhere to go, resulting in overland flow…

We know that extreme rainfall events are becoming more severe and more frequent.



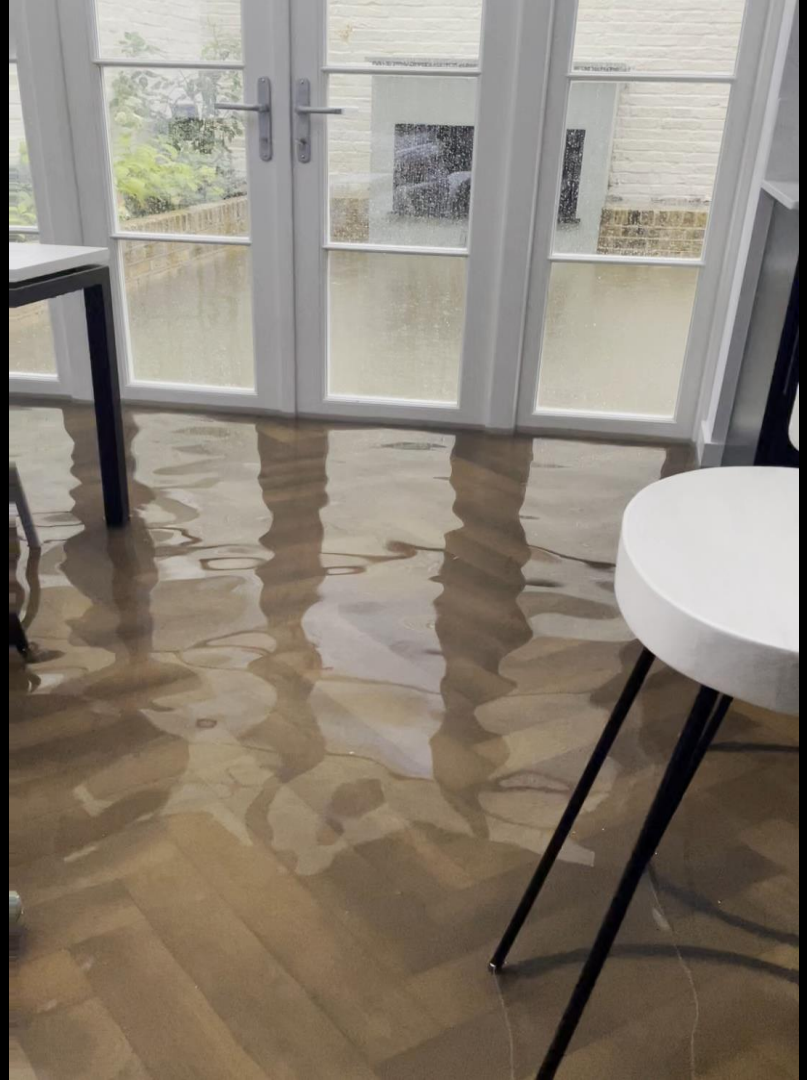
We know that basements are especially vulnerable to surface flood water ingress because they are a low spot which will “trap” water which could ingress at above external ground level over door thresholds, through wall cavities, air bricks, window reveals, service penetrations, down the stair well etc.


Thames Water
“In July 2021 London was hit twice by extreme rainfall, which led to widespread flooding. At its heaviest, a month’s rain fell on some parts of the capital in just one hour.”
www.thameswater.co.uk

www.thameswater.co.uk

“The speed, severity and scale of this rainfall tested our sewers and local authorities drains and gullies beyond the limits they were designed to cope with.”

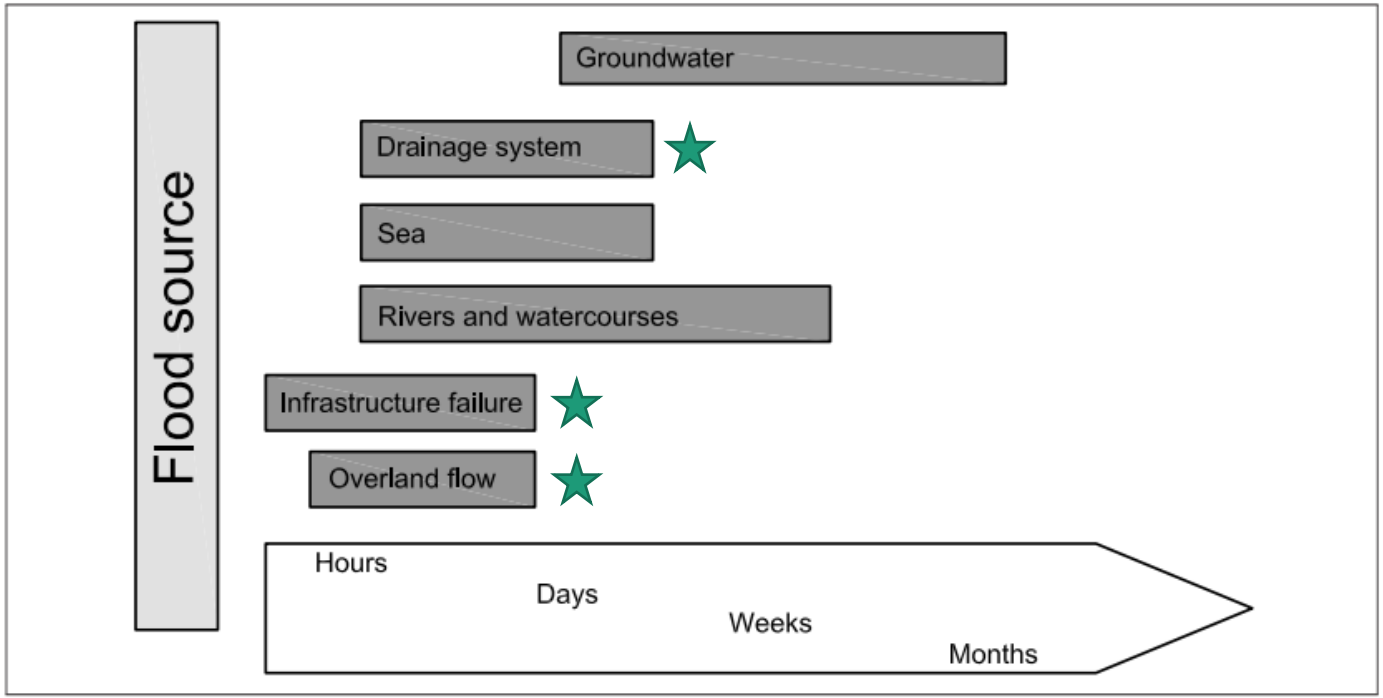
Lower ground floor apartment,
North London, June 2021



Lower ground floor apartment, London, 12th July 2021

Where did the surface flood water come from?

Figure 1 **Typical flood durations**



How did the flood water get in?

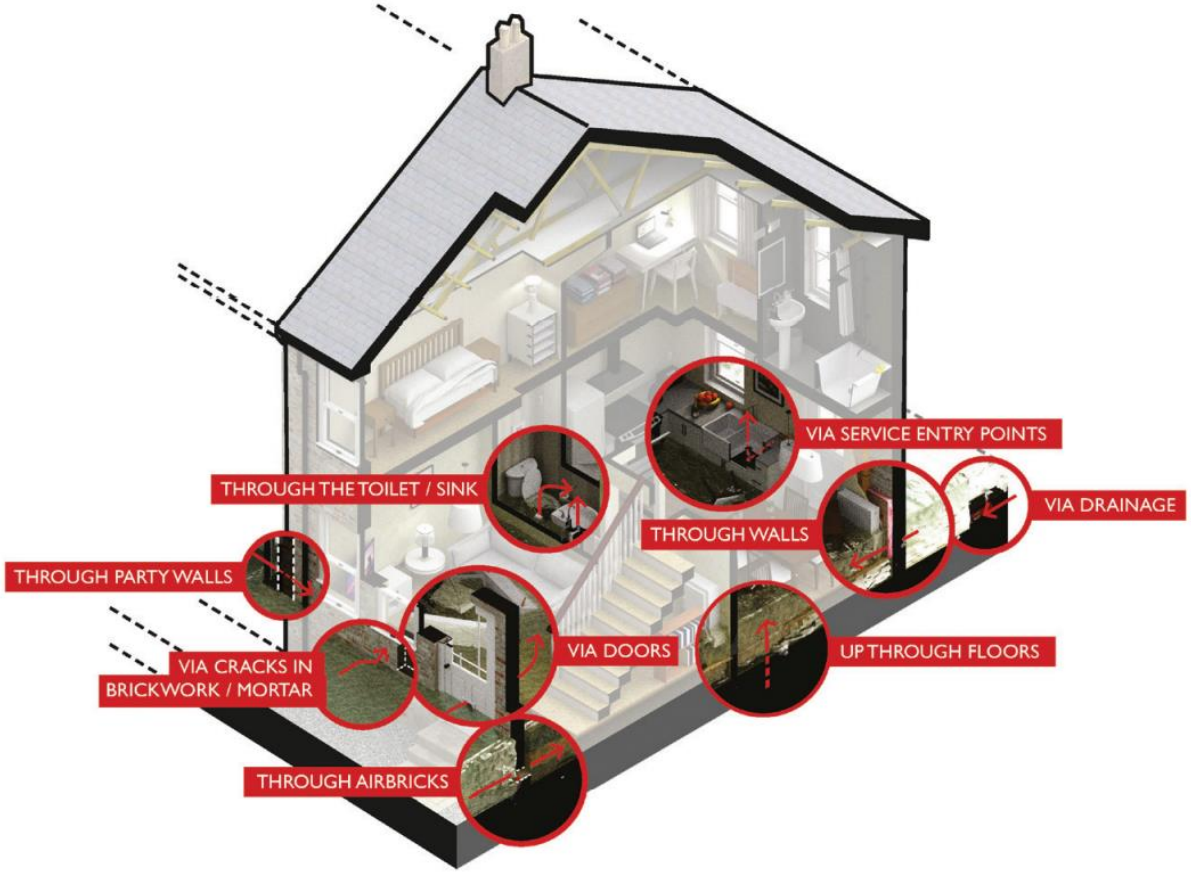


Figure 13.2 Possible routes of floodwater entry to a property

CIRIA, C790B

What did the flood water contain?

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Code of Practice
For the Recovery of Flood Damaged Buildings (2013)

1 DEFINITIONS

BLACK WATER (sewage)
Water containing bodily or other biological wastes, such as from toilets or drains.

GREY WATER
Non-industrial wastewater generated from domestic processes such as washing, laundry and bathing.

And where did some of the flood water go?

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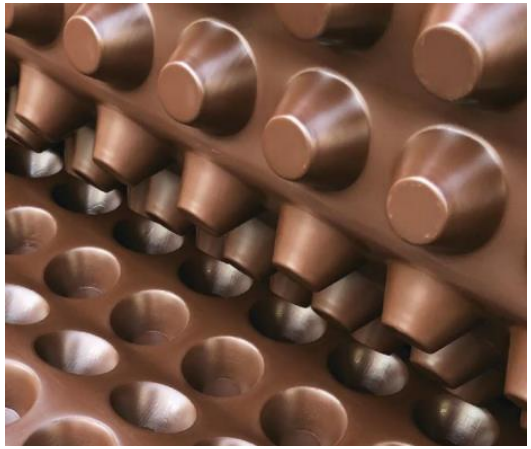
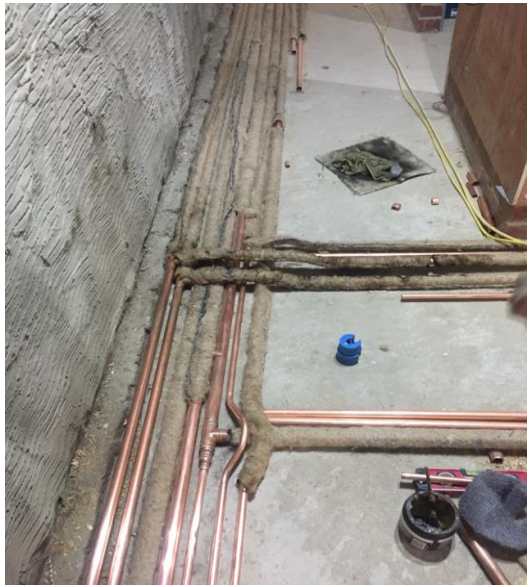
For the Recovery of Flood Damaged Buildings (2013)





7.4.1 Basements

Rooms that are partially or fully underground are particularly susceptible to flooding and may remain under water for significantly longer than rooms above ground level. In basements that have been waterproofed to make them suitable for occupation, floodwater could affect the wall finishes and insulation materials incorporated in the design. It is also possible for flood water to become trapped in voids created by waterproofing works below ground. Examples include water within the dimples on what is usually the dry side of cavity drain membranes, below floors and behind stud walls.

What were the implications for existing construction materials?

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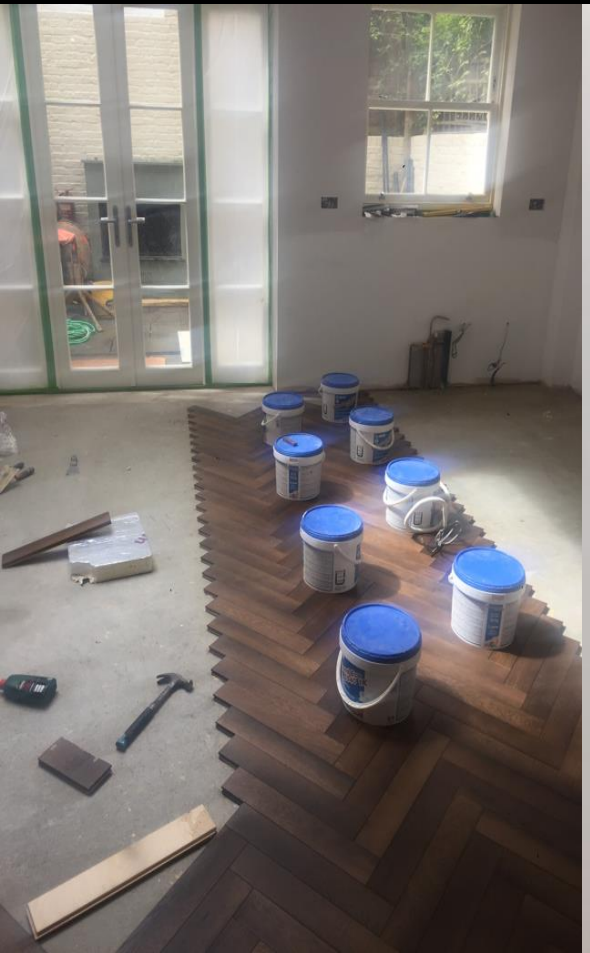
For the Recovery of Flood Damaged Buildings (2013)

7.2.4 Construction materials

Establishing the range and locations of construction materials that have been utilised within the building can be very important. The materials used to build the walls and floors are usually of greatest significance.

Were the existing construction materials “recoverable”?



What does “recoverable” mean?

- Did the existing construction materials return to there former properties and performance levels following immersion in water?
- Were any construction material manufacturers or installers guarantees invalidated as a result of the flood?
- Were the client’s living standards, mental health, financial interests and investments in the property compromised as a result of the flood?

Could any protection measures have been put in place?

- Could the worst of the damage caused by the surface flood water have been mitigated or avoided?
- Could the surface flood water, or at least some of it have been kept out of the basement?
- Could the source, depth and duration of the surface water flooding have been predicted?

As basement waterproofing specialists, is the management of risk associated with effects of surface water flooding in basements our responsibility?

BSI Standards Publication

Protection of below ground structures against water ingress — Code of practice

BSI Standards Publication

1. Scope: “includes guidance on methods of dealing with and preventing the entry of **water from external sources** into structures that are wholly or partly below ground.”

1. Scope: “includes guidance on drainage outside the structure and **recognizes the risk of water entering the structure through openings**.”

1. Scope: Note 3: “Standards and guidance for the **protection of buildings against flooding by means of property level flood resistance and resilience measures** are given in **BS85500**.”

BS8102:2022 Protection of below ground structures against water ingress – Code of practice

BS 85500:2015

BSI Standards Publication

Flood resistant and resilient construction – Guide to improving the flood performance of buildings

Brian Dawson, Current version as of 30 November 2015
multi-user/network access visit www.bsigroup.com/licens

BSI Standards Publication

5.1.1 Desk Study

The design team should carry out a desk study in accordance with **BS5930 2015 Code of practice for ground investigations** to:

"a) assess the geology and hydrogeology , including soil permeabilities, **flood risk**, radon, methane and other ground gases and contaminants (e.g. hydrocarbons, chlorides and acids);"

"d) establish the **impact of flooding**."

BSI Standards Publication

5.1.2 Risk Assessment

The risk assessment should take into account:

“a) The potential effects of **climate change**, burst water mains, **flooding**, defects in sustainable underground sustainable urban drainage (SUD) systems and defective soakaways and sewers ”

BSI Standards Publication

6 Water resisting design

6.1 Groundwater

"Waterproofing measures should be designed on the basis that during the lifetime of the structure **water** might come against any part of the structure that is **at or below ground level,** or is earth retaining. Waterproofing should therefore, wherever practicable, be taken **above ground level by a minimum of 150mm** and/or be continuous over the top of the structure"

BSI Standards Publication

6 Water resisting design

6.1 Groundwater

Protection against water ingress from the following three sources should also be taken into account:

1) The **inflow of surface water**, including percolation of rain, inundation of water during storm events and from burst water mains.

2) The water pressures acting on the external structure; and

3) Flooding from **surface pluvial, fluvial**, groundwater, or coastal or drainage/other sources.

The risk of flooding from **surcharging of sewers** should be taken into account.

Where does this leave us?

If we opt to claim full compliance with BS8102:2022 we have a duty of care to:

- Take the revisions/additions into account when designing and writing our reports.
- Be aware of the requirement to identify the potential for flooding from external sources and its potential effects e.g. “source, pathway, receptor” method.
- Inform the client of potential risks and/or the need to have them investigated by an “expert” third party to better inform your waterproofing design.
- Gain understanding of the principles of flood “**resistance, resilience and recoverability**” as referred to in BS85500:2015, Ciria C790 and other guidance documents.
- Define your strategy relating to surface water e.g. planning for “**water exclusion**” but allowing for “**water entry**”.
- Enable the client to make “cost v risk” decisions regarding flood resilience measures.
- Clearly state in writing any limitations on our guarantee and liability.

So, can we realistically guarantee to prevent surface flood water from entering a basement through ground floor pathways?

NO!

This strategy is often used in combination with one of the other strategies. In particular, where the water is likely to be contaminated (e.g. seawater or sewage), as much resistance as possible should be provided with the resilience.

Table 4 summarizes the choice of strategy between flood resistance and resilience.

Table 4 **Selection of strategy**

Design flood water depth above ground floor level [A]	Strategy
Less than 300 mm	Resistance [B]
300 mm to 600 mm	Resistance + resilience
More than 600 mm	Resilience + resistance for lesser events

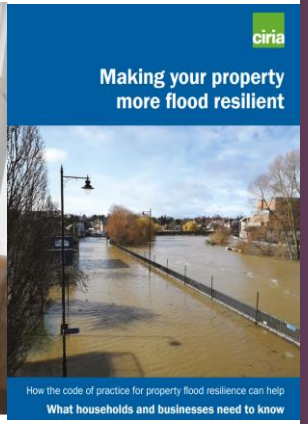
[A] See **6.1**.

[B] Groundwater and long duration flooding could additionally require resilience.

Some information sources and references

Code of practice for property flood resilience

Edition 2



CIRIA C790A

London, 2020

AVIVA

ice CIWEM Chartered Institution of Water and Environmental Management RICS

Local Government Association

Environment Agency

Flooding from groundwater

Practical advice to help you reduce the impact of flooding from groundwater

There are some key features of flooding from groundwater:

- Flooding will usually occur days or even weeks after heavy or prolonged rainfall.
- Flooding may occur for a long time, often lasting several weeks.
- The water doesn't always appear where you would expect it to (i.e. valley bottoms). It may also emerge on hillsides.
- Water may rise up through floors rather than coming in through doors.

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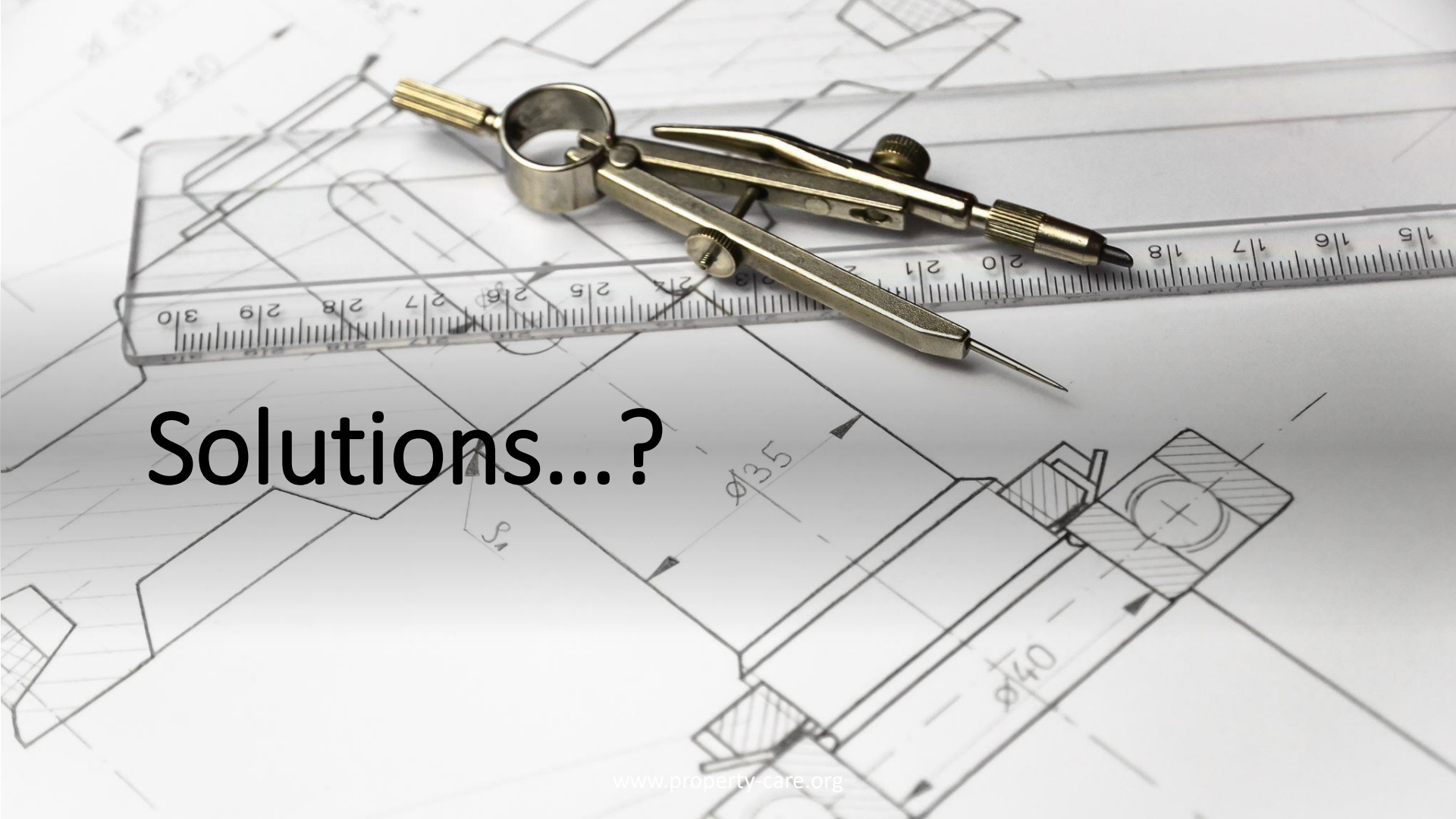
Code of Practice
For the Recovery of Flood Damaged Buildings

Extent of flooding from rivers or the sea

High Medium Low Very low Location you selected

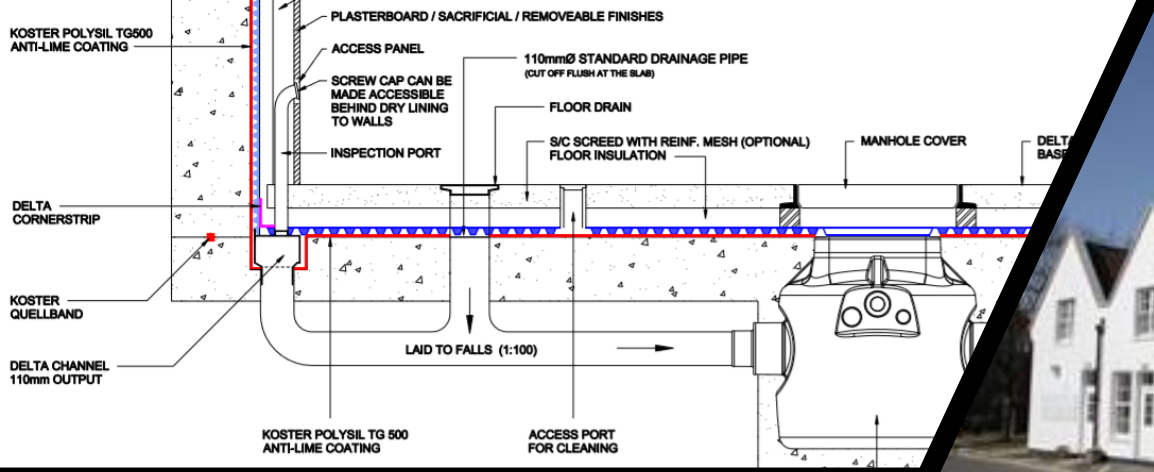
Extent of flooding from surface water

High Medium Low Very low Location you selected

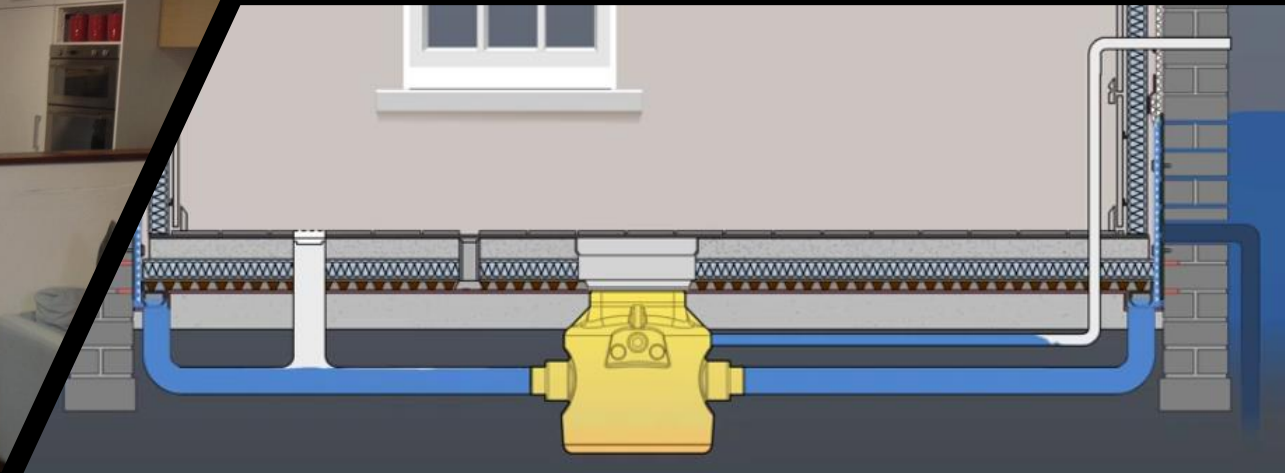

Solutions…?
www.property-care.org

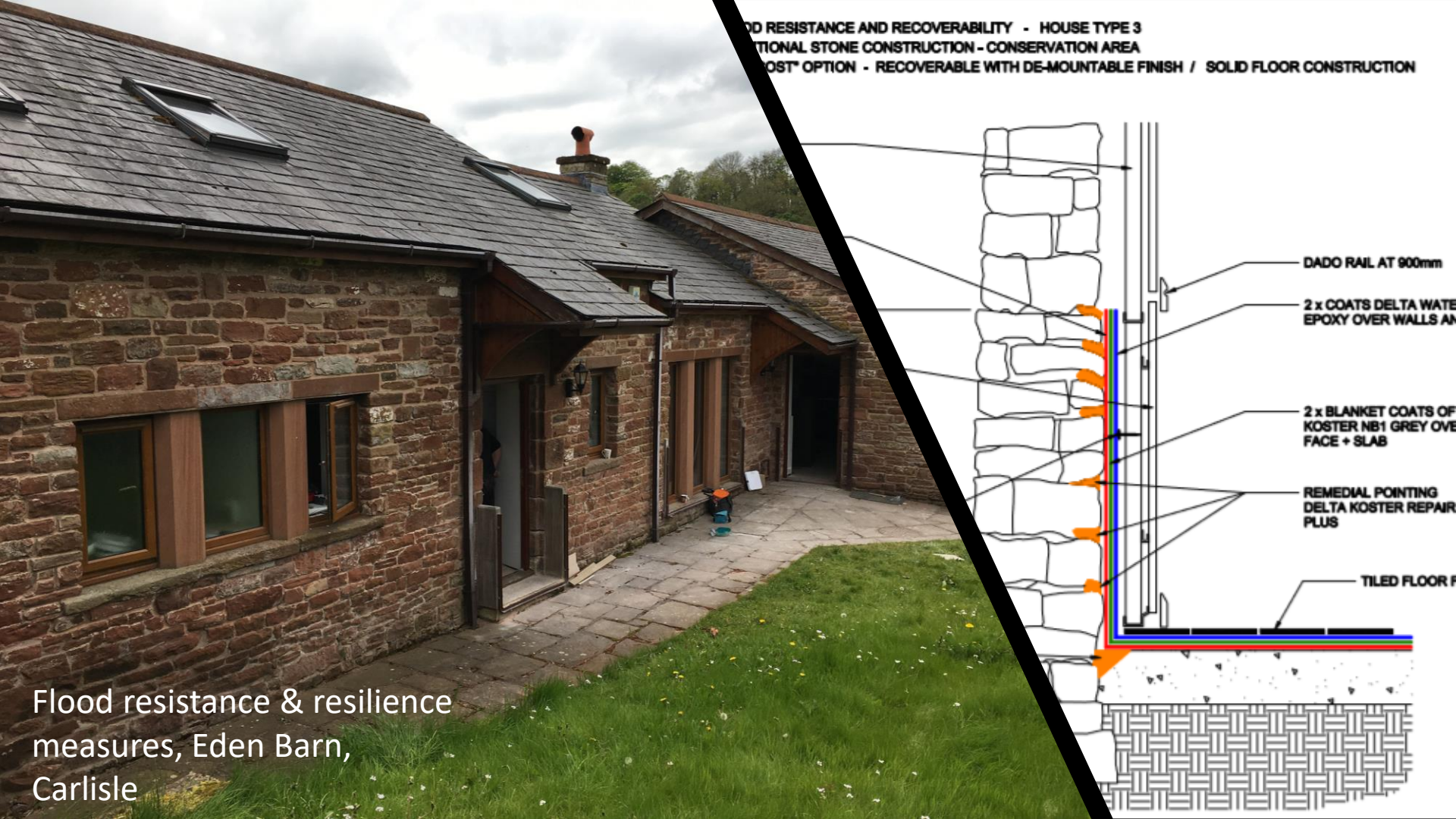

Of Course!!!!


Innovate!!!!


KOSTER POLYSIL TG500
ANTI-LIME COATING
PLASTERBOARD / SACRIFICIAL / REMOVEABLE FINISHES
ACCESS PANEL
110mmØ STANDARD DRAINAGE PIPE
(CUT OFF FLUSH AT THE SLAB)
SCREW CAP CAN BE
MADE ACCESSIBLE
BEHIND DRY LINING
TO WALLS
FLOOR DRAIN
INSPECTION PORT
S/C SCREED WITH REINF. MESH (OPTIONAL)
FLOOR INSULATION
MANHOLE COVER
DELTA
CORNERSTRIP
KOSTER
QUELLBAND
DELTA CHANNEL
110mm OUTPUT
LAID TO FALLS (1:100)
KOSTER POLYSIL TG 500
ANTI-LIME COATING
ACCESS PORT
FOR CLEANING

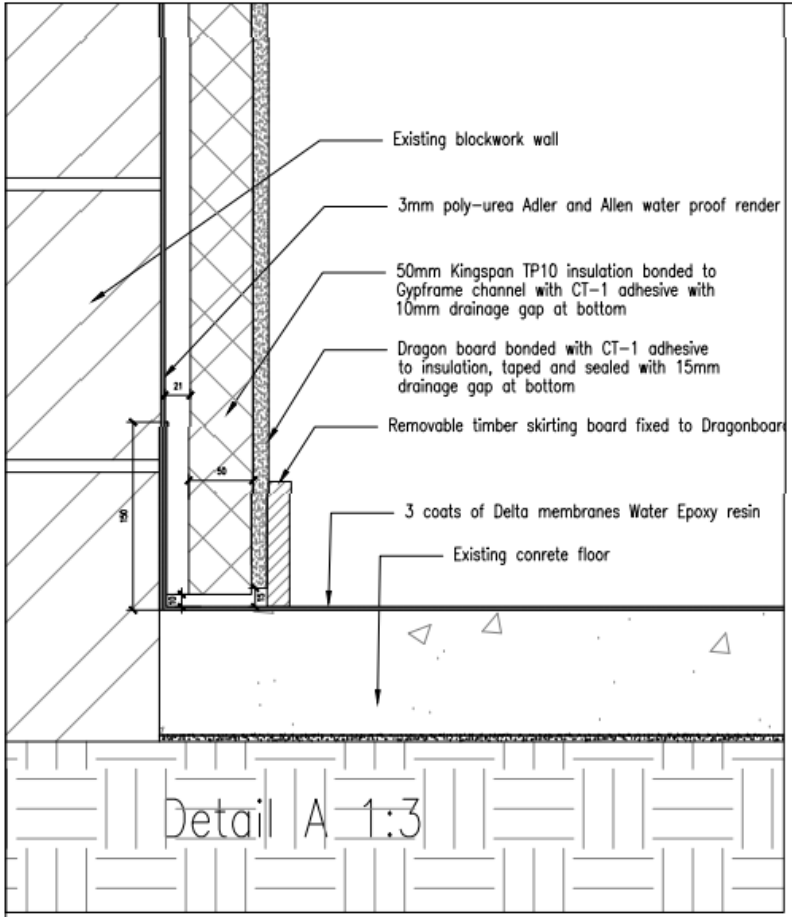

BRE “Flood House”, Watford

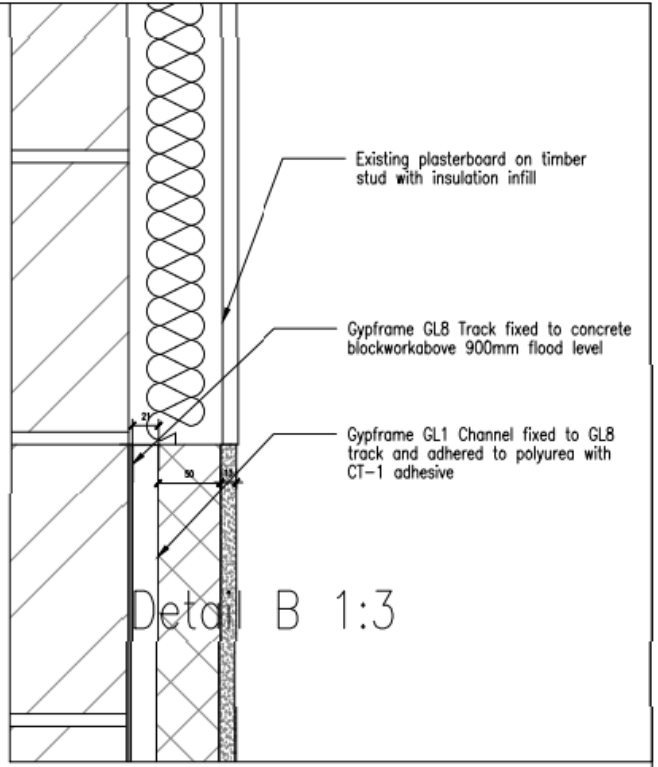




Flood resistance & resilience measures, Eden Barn, Carlisle

Flood resistance & resilience measures, Eden Barn, Carlisle





AQUOBEX®

FLOOD MANAGEMENT SOLUTIONS

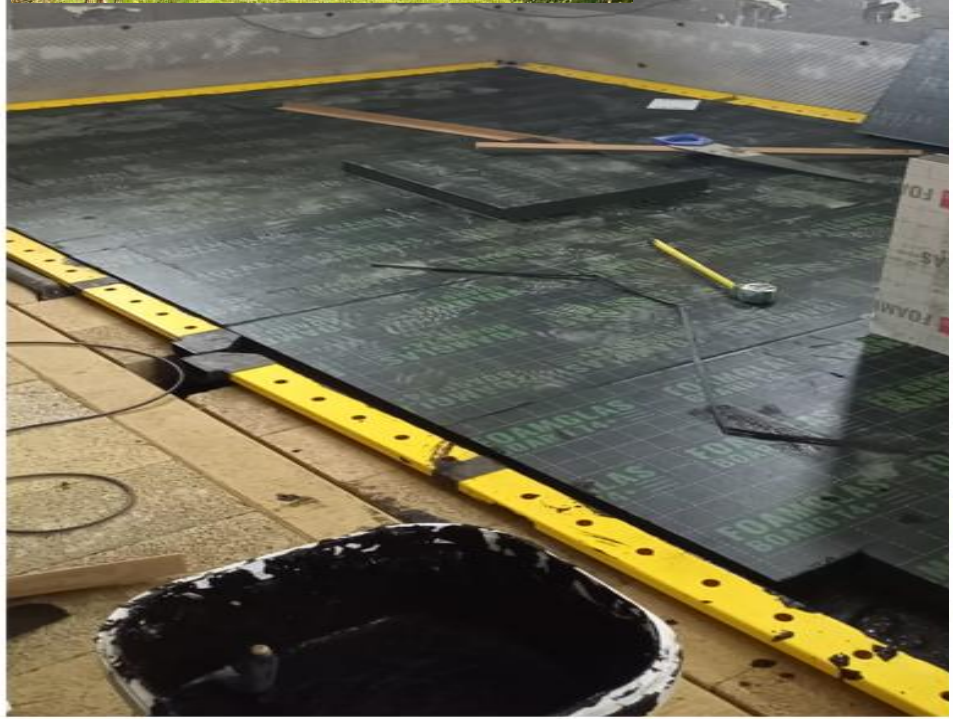
Unit 4 Genesis Building, Harwell Campus, Oxfordshire, OX11 0SG.
07909 700777

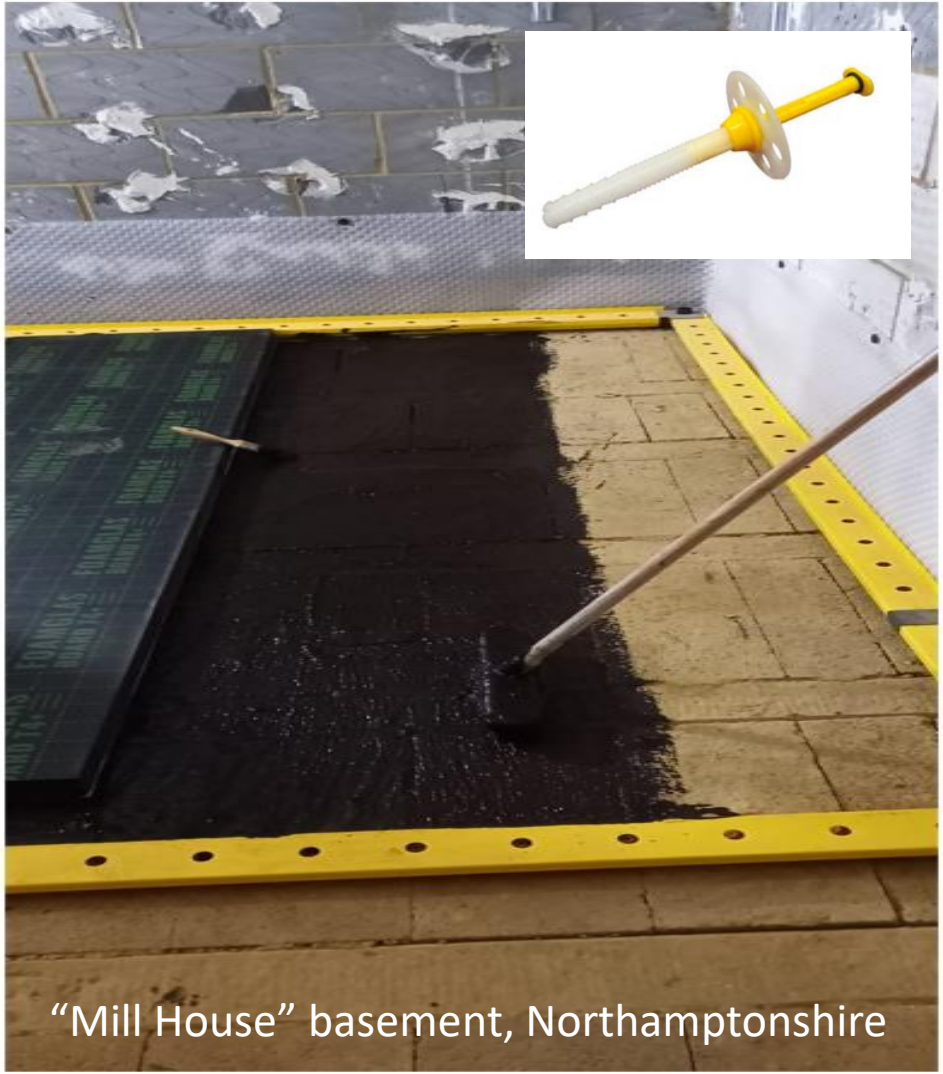
Project: Carlisle Flood Resilience Property.

Drawing: Details A and B

Scale: 1:3

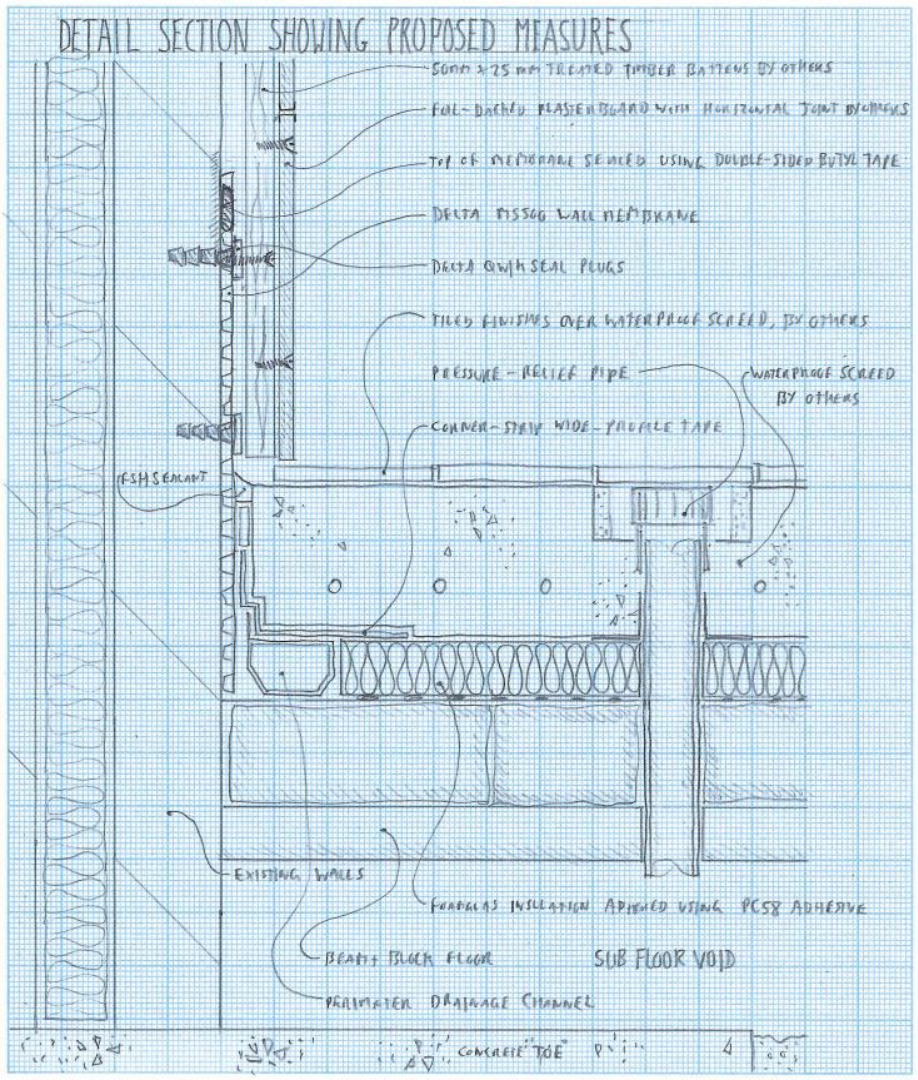
Flood resistance and resilience measures,
Lymm, Cheshire



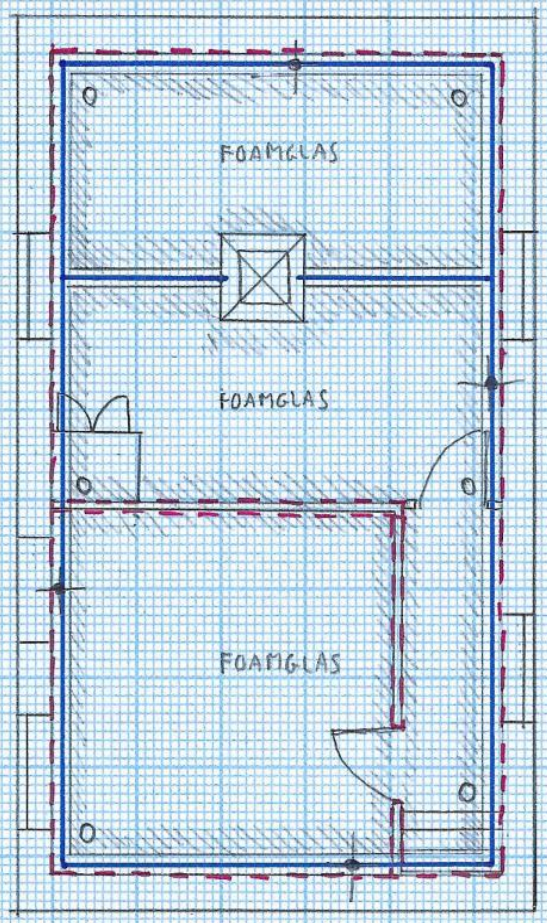


“Mill House” basement, Northamptonshire

DETAIL SECTION SHOWING PROPOSED MEASURES



BASEMENT LAYOUT PLAN



KEY

- PRESSURE RELIEF PIPES
- INJECTION PORTS
- PERIMETER CHANNEL
- SUMP + PUMP UNIT
- 500mm MEMBRANE UPSTAND.

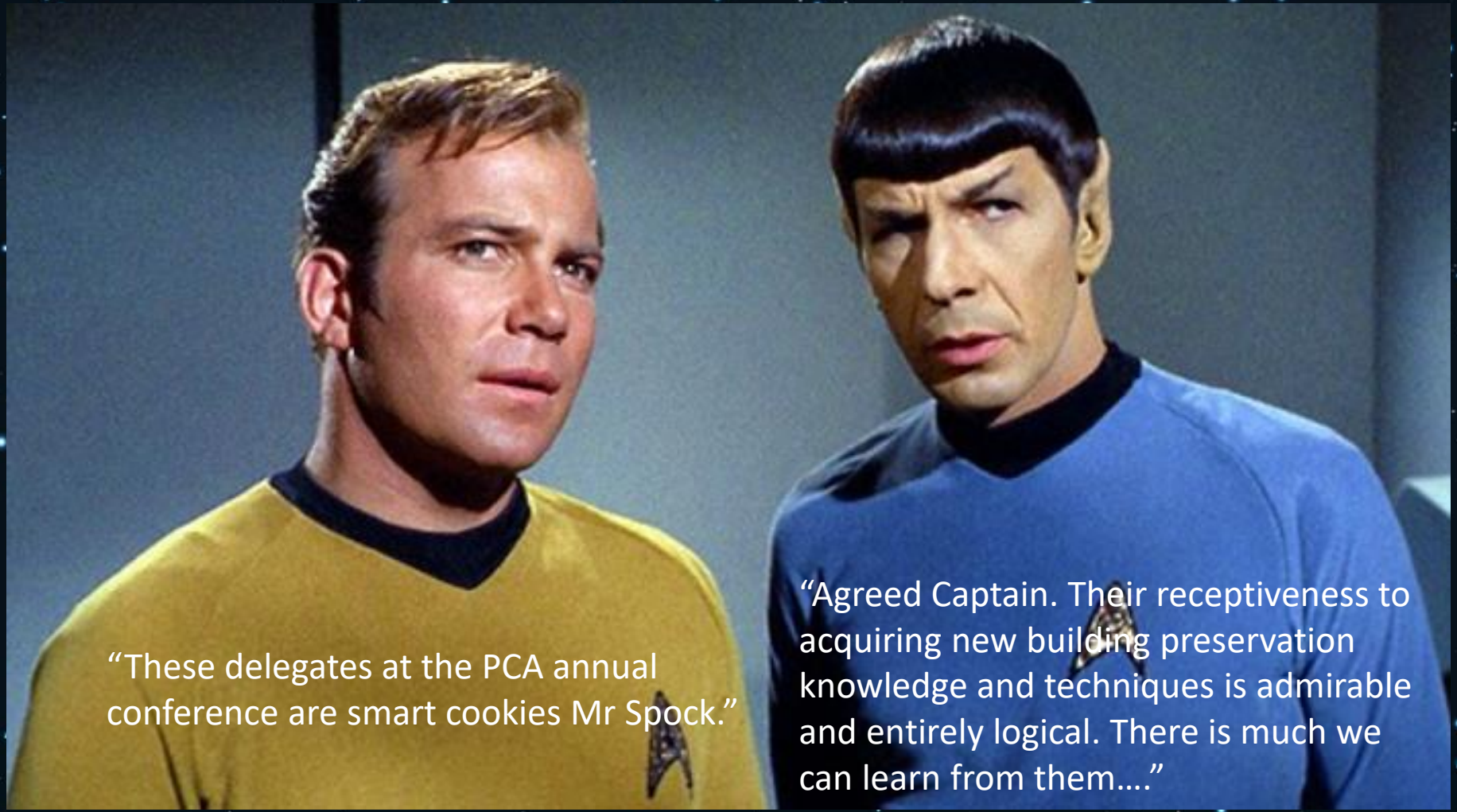
Combining technologies and expertise!

FLOOD EXPO

14-15 September 2022 | NEC Birmingham

Buckinghamshire Council


Joined-up thinking is
the key to stellar
solutions !!!!


“These delegates at the PCA annual conference are smart cookies Mr Spock.”
“Agreed Captain. Their receptiveness to acquiring new building preservation knowledge and techniques is admirable and entirely logical. There is much we can learn from them….”

A **BIG THANKS** For Listening

For more help, information, technical docs or general updates,
check out the links below

www.property-care.org

Linkedin.com/company/property-care-association

Facebook.com/PropertyCareAssociation

Twitter.com/pcapropertycare