

BUILT TO PROTECT

Flood Resilience





Designing for Flood Resilience and Resistance

Repair After Flooding

After a property is flooded, it should be assumed that it could be at risk from future flooding. Therefore, the property should be repaired by improving the resistance or resilience of the building to reduce future impacts to the occupants:

Improved Resistance – water exclusion strategy (can be employed up to 0.6 m). Use low permeability materials designed to keep flood water out of a building. This is not always possible, and cannot be employed for flood waters above 0.6 m due to structural concerns.

Improved Resilience – water entry strategy (for expected flood waters greater than 0.6 m). Accepting that water will enter a property, use materials that will not be damaged by flood water, or can be easily repaired or replaced. This offers a more robust strategy as it is not always possible to completely stop flood water from entering a property.

Flood Repairable – use materials that can be easily repaired or replaced.

The potential flood risk, expected flood depth and duration should be determined for the property and should inform the level of repair. Information on flood risk is available from https://www.gov.uk/check-floodrisk or a flood survey can be carried out by a qualified surveyor.

Design Water Depth up to 0.3 m	Design Water Depth from 0.3 m to 0.6 m	Design Water Depth above 0.6 m
Water Exclusion Strategy Attempt to keep water out	Attempt to keep water out, if structural concerns exist use water entry strategy	Water Entry Strategy Allow water in to avoid structural damage
Materials and constructions with low permeability.	Materials with low permeability to at least 0.3 m. Flood resilient materials and design.	Flood resilient design, access to all spaces to permit drying.

Internal Repair

Care should be taken to repair the property using materials that will minimise the impact to the property after flooding. For instance a simple change from gypsum plaster, which is easily damaged by water ingress, to a lightweight cement based **Dryzone® Damp-Resistant Renovation Plasters** will allow easy cleaning and avoid replacement costs. Focus should be on using resilient and easily cleanable materials for internal finishes such as cement and lime renovation plasters, tiles and PVC skirting. If possible kitchen units should be raised off the ground and easily removable to allow cleaning or replacement. Electrical sockets should be raised above flood height. The installation of a secondary chemical DPC, such as **Dryrod® Damp-Proofing Rods**, into a masonry wall can control capillary rise through the wall.

External Repair

Externally, walls should be repaired so that cracks in bricks or render are filled and the mortar joints of the walls should be maintained in good condition with a mortar mix originally used in the construction. **Stormdry® Masonry Protection Cream** should be used to protect porous materials such as brick and stone. Proprietary air vents should be installed that automatically prevent water entry during a flood and door thresholds should be raised.

How Does Flood Water Enter a Building?

Flood water will always follow a path of least resistance and will enter a building at the weakest points in the construction, particularly through masonry and construction joints, and any voids and gaps.

Party Walls •

Water can enter through walls from neighbouring properties.

<u>Solution:</u> neighbours should also consider appropriate flood protection measures

Vents and Airbricks

<u>Solution:</u> covers or air vents should be installed that automatically prevent water entry during a flood.

Service Penetrations •

Water can enter through utility pipes, ventilation ducts, and gaps in walls and floors for things such as electricity and telephone cables.

Solution: gaps around service entry points can be sealed with suitable foam or other sealants.

Porous Masonry -

Water can enter through permeable brickwork and weathered or damaged mortar.

Solution: Protect walls externally by fixing cracks, repointing to a high standard using **Stormdry® Repointing Additive No. 2** and protect the porous brick or stone using Stormdry® Masonry Protection Cream.

Plaster

Gypsum plasters are not suitable for flood prone properties as they lose their integrity when exposed to water. Internal cement plaster should be avoided as these can prevent effective drying. Anecdotal evidence suggests that full strength lime plaster can be a good solution. However, lime plaster can take months to years to reach full strength. Because of this, if a flood is expected within a year, repairing with lime plaster should be avoided. Tests performed on young lime plaster showed that it crumbles very easily under water pressure – see fig. 2 (graph of flexural strength).

Solution: Light-weight, highly breathable and damp-resistant cement based renovation plasters, such as Dryzone® Damp-Resistant Renovation Plasters, represent a good option for internal repair as these offer good flood resilience properties and can be left in place after flooding. For a flood repairable option, gypsum plasterboard can be used, with boards installed horizontally to allow easy removal and replacement after flooding, such as with the Dryzone® Express Replastering System.



Cracks in External Walls

Water can enter through cracks and gaps in walls, caused by weathering, settlement or poor construction.

<u>Solution</u>: Crack-bridging coatings such as **Stormdry**[®] **MAX** can be used to bridge smaller cracks in masonry and mortar joints. Larger cracks can be fixed with crack stitching kits such as **BrickFix**[™].

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Windows, Doors and Frames

Water can enter through inadequate seals between windows, doors and frames.

Solution: Door thresholds should be raised. All seals around openings such as window frames should be repaired with high quality sealant.

Ground

Seepage from below ground through floors and basements.

<u>Solution:</u> This can be countered by installing a damp-proof membrane and on older properties ensuring DPCs are installed and in good condition. If not, consider installing a chemical DPC using **Dryrod® Damp-Proofing Rods**.



Flood System 1 (Resilience):

This system uses Dryzone® Damp-Resistant Plaster and Dryzone® Hi-Lime Finishing Plaster as a flood resilient wall coating. The specially designed plaster and skim finish retain their strength and dimensions even under flood conditions, unlike traditional gypsum plasters which should be avoided in flood prone properties. They are specially formulated to be highly breathable to allow quick drying out of walls after flooding and the alkaline nature of the materials can minimise mould growth on the surface. The plaster is combined with a secondary chemical DPC installed above design flood height. This is formed using Dryrod® Damp-Proofing Rods. Drybase® Liquid-Applied DPM should be used to seal the floor and lap up the wall to DPC level. This should be combined with other appropriate flood resistant materials such as tiled flooring and tiled or PVC skirting boards.



Dryzone® Damp-0.6 Metre **Resistant Plaster** Flood Leve (Rough Coat) Dryzone® Damp-**Resistant Plaster** Dryzone® Hi-Lime **Finishing Plaster** Drvrods[®]/ Dryzone® DPC Dryzone **Mould-Resistant Emulsion Paint** Drybase Liquid-Tiled Floor Applied DPM

Flood System 1 (Repairable):

Dryzone® Express Replastering System offers a flood repairable option. Drygrip[™] Adhesive is used as a salt and damp-resistant glue for securing plasterboard and can securely fasten plasterboard even on very damp walls. It is used in conjunction with Dryshield® Cream as part of the Dryzone® System for replastering after flooding. Dryshield® Cream is a breathable salt and mould-resistant and water-repellent cream that can aid drying out of walls after flooding. Plaster boards are placed horizontally to allow easy removal and replacement after flooding occurs. This system allows occupants to use their property far sooner after flooding than more traditional repair methods.

Flood System 1 Pack





Flood System 2 (Resilience):

This follows from the design of Flood System 1 with the use Stormdry® Masonry Protection products to provide some external protection from flood water. Masonry should first be repointed to a high standard using Stormdry[®] Repointing Additive No.2. After allowing two weeks to cure, Stormdry[®] Masonry Protection Cream should be applied.

Test work demonstrates that repointing with Stormdry® Repointing Additive No.2 and applying Stormdry® Cream to a wall can greatly reduce the flow rate of water through the wall. E.g. At a flood water height of 0.6 m, the flow rate through a single skin Fletton brick wall is reduced from 12.5 litres/m²/min to less than 0.2 litres/m²/min. Stormdry[®] Cream can aid drying out of walls after flooding.

For added protection on particularly porous or damaged brickwork, Stormdry[®] MAX can be applied up to a height of 0.6 m, this will bridge cracks in masonry up to 0.6 mm.



Flood System 2 Pack



CAD Details CAD drawings for all details and complete system.



CAWS Clauses CAWS Clauses for all details and complete system.

Request Pack & Discuss Requirements:

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Flood System 2 (Repairable):

This follows from the design of Flood System 1 with the use Stormdry® Masonry Protection products to provide some external protection from flood water. This system then uses the Dryzone® Express Replastering with Dryshield[®] Cream and water resistant Drygrip[™] Adhesive to secure plasterboard internally, in combination with the Stormdry® Masonry Protection Cream to offer increased external resistance. Plasterboards are installed horizontally to allow quick replacement after flooding occurs. This system allows occupants to use their property far sooner after flooding than more traditional repair methods.

Resilience with Enhanced Resistance



Flood System 3 (Resilience):

This follows on from the design of Flood System 2 with enhanced resistance from the use of Drybase® Universal Mortar and Drybase® Tanking Slurry internally. Drybase® Universal Mortar is a joint fill compound that can be used to seal the floor-wall junction, which is typically a weak point in construction, offering increased resistance to flood water. Drybase® Tanking Slurry is a cementitious tanking product that provides waterproofing at negative pressures in excess of flood design height. This can be applied up to a height of 0.6 m to seal the wall and block entry of flood water into the property. This extra layer could reduce the drying rate of the wall after a flood.





Flood System 3 (Repairable):

This follows on from the design of Flood System 2 with enhanced resistance from the use of Drybase® Universal Mortar and Drybase® Tanking Slurry internally. This is combined with the Dryzone® Express Replastering System with plasterboard placed horizontally to allow quick repair after flooding.

Flood System 3 Pack



Botcherby Community Centre Flood Resilience

Background

The Botcherby Community centre is located in Carlisle, an area at high risk of flooding. It is used as an important centre for the local community but had not been up and running since flooding occurred during the winter of 2015/2016.

It is a focal point for communal activities in the area and local residents were severely disadvantaged by its closure, forcing any events to occur offsite at various locations. The centre had previously been awarded £15,000 from the Cumbria Flood Recovery Appeal and the majority of flood rectification measures had been completed using that budget.







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The Problem

The flooding that occurred in 2015/2016 was extensive and major works were required throughout the building. Most of the reconstruction work on the property had already been completed. However, the kitchen area remained unfinished. In order to protect the property from further damage from future flooding, the kitchen needed to be made flood-resilient.

Safeguard Europe were brought in as damp-proofing and waterproofing experts to assist in specifying the correct systems and materials to ensure that any future flood events would not significantly disrupt the centre's various activities.

The Solution

Flood System 2 was chosen as the best solution. Both the flood-resilient and flood-repairable methods were showcased. As the first measure of protection from flooding, Stormdry® Masonry Protection Cream was applied to the outside of the building. Stormdry® Masonry Protection **Cream** is a breathable masonry sealant, which protects brickwork from water ingress and provides additional resistance to future flooding. Stormdry® Masonry Protection Cream will allow the walls to dry out faster after a flood. Inside the kitchen, all timber studding was removed and replaced with blockwork up to a height of up to 1.2 m in order to provide further resistance to floodwater.

Drybase® Universal Mortar was applied to the wall/floor junction. As this is one of the weakest points for flood water entry, two coats of Drybase® Liquid-Applied DPM were applied to the floor and lapped up the wall to further protect the wall/floor junction. Drybase® Liquid-Applied DPM can be applied by brush or roller and dries to form a waterproof membrane.

For the Flood System 2 Resilience option, Dryzone® Damp-Resistant Plaster was applied to the external walls up to a height of 1.2 m. The Flood System 2 repairable option was used on the internal walls and new blockwork. This is based on the Dryzone® Express Replastering System, which uses Dryshield[®] Cream to protect walls from the effects of moisture and water-resistant Drygrip[™] Adhesive to safely secure plasterboard. The plasterboards were installed horizontally to allow quick replacement after flooding occurs. Dryzone® Express Replastering System allows occupants to use their property far sooner after flooding than more traditional repair methods.

As the final step, the walls were skimmed using Dryzone® Hi-Lime Finishing Plaster. This plaster specification controls salt migration and, owing to its highly-porous structure, allows walls to guickly dry out by evaporation. Dryzone® Hi-Lime Finishing Plaster leaves a rustic off-white finish that can be left unpainted while walls dry out from the floodwater and then decorated at a later date

Flooding CPD Seminars

Safeguard offer CPD seminars on the topics of flood resilience and flood resistance.

Specifiers are faced with a number of decisions when it comes to flood resilience and flood resistance. Aside from product choice, decisions need to be made about whether to waterproof internally or externally, and whether to rely on a single waterproofing system or a combination of systems.

The seminars provide a useful overview of the choices available with reference to their appropriateness for different types of structure.



Further Information

Information on the flood risk to your property is available from the Flood Information Service: https://flood-warning-information.service.gov.uk/warnings

- Flood Information Service: https://flood-warning-information.service. gov.uk/warnings
- Check Your Flood Risk: https://www.gov.uk/check-flood-risk

Further information on the principles of good floor repair can be found in the various guides listed below.

- CIRIA C623 London, 2005 Standards for the repair of buildings following flooding
- BS 85500:2015, Flood resistant and resilient construction Guide to improving the flood performance of buildings
- BRE Good Repair Guide 11 Repairing flood damage

Finally, the Property Care Association offer flood protection advice, and can advise on qualified flood surveyors *http://www.property-care.org/ homeowners/flood-protection/*







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