



## Measure Booklet

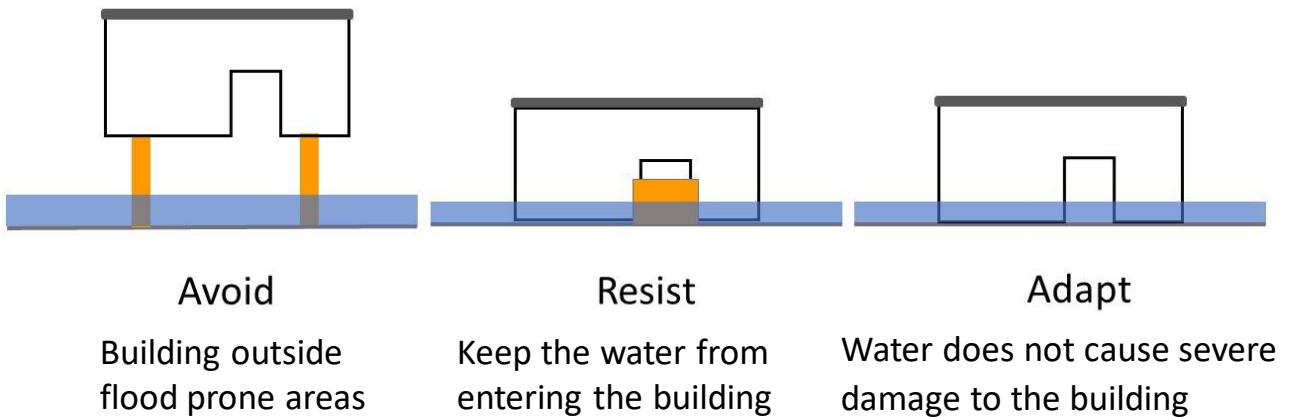
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## Introduction

Because of climate change floods and heavy rain events will occur more frequently. For communities to become more resilient, large-scale infrastructure measures must be complemented by precautionary measures of the residents. This means construction methods, structural measures and behavioural patterns.

The FLOODLABEL<sub>GHANA</sub> provides information about the hazards and vulnerability. This booklet contains more information on the measures recommended by the expert.

Mainly, there are three strategies for flood protection: avoid, adapt and resist.

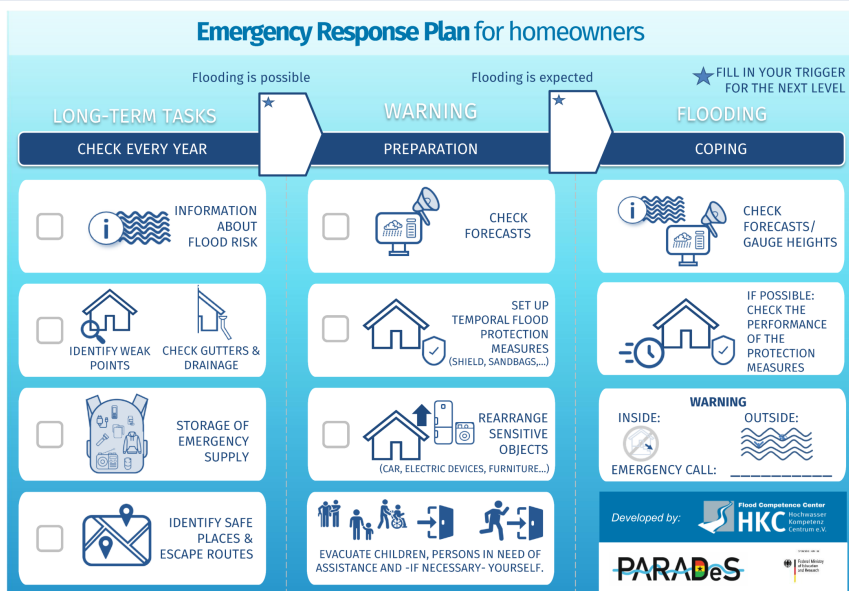


The most effective way of flood protection is to avoid flood prone areas. However, this strategy cannot be applied to existing buildings and furthermore heavy rain could occur everywhere and thus affect every house. The strategies resist (keep the water from entering) and adapt (avoiding damage from flooding) can be used in parallel. In addition to the strategies already mentioned, behavioral precaution is essential. Setting up an Emergency Plan helps to think through and organize the necessary steps or tasks and thus helps to avoid stress and mistakes in case of emergency.

Major infrastructure and housing measures should also be complemented by further improvements in the undeveloped spaces, such as increase of infiltration. At the end of this booklet, different ways of further contributing to resilience are presented.

## Emergency response plan

No. 1



Preparing an emergency response plan will help thinking through all the details that will demand attention as the floodwaters approach. Before, during and after the event there are many tasks to be done which demands coordination in a hectic and agitated situation which is difficult to pursue without a plan. This is a project for the whole family. The family should write down a plan together so that everyone understands it. And having the plan written helps people remember what to do when everyone is in a hurry and nervous due to an approaching flood.

The emergency response plan depends on the type of flood hazard, status of technical flood protection, available local warning procedures and the estimated warning time. The response time may be a couple of hours or even days for larger rivers and less than an hour for smaller rivers. In the latter case people might only have enough time to evacuate the house. In some extreme cases of flash floods, no warning time is available at all. Depending on the local characteristics, the triggers should be considered setting up emergency response plan.

# Emergency Response Plan for homeowners

Flooding is possible

Flooding is expected

★ FILL IN YOUR TRIGGER FOR THE NEXT LEVEL

**LONG-TERM TASKS**

**CHECK EVERY YEAR**

**WARNING**

**PREPARATION**

**FLOODING**

**COPING**


☐

**INFORMATION ABOUT FLOOD RISK**



☐

**CHECK FORECASTS**



☐

**CHECK FORECASTS/ GAUGE HEIGHTS**



☐

**IDENTIFY WEAK POINTS**

**CHECK GUTTERS & DRAINAGE**



☐

**SET UP TEMPORAL FLOOD PROTECTION MEASURES (SHIELD, SANDBAGS,...)**



☐

**IF POSSIBLE: CHECK THE PERFORMANCE OF THE PROTECTION MEASURES**



☐

**STORAGE OF EMERGENCY SUPPLY**



☐

**REARRANGE SENSITIVE OBJECTS (CAR, ELECTRIC DEVICES, FURNITURE...)**



☐

**WARNING**

**INSIDE:** 

**OUTSIDE:** 

**EMERGENCY CALL:** \_\_\_\_\_

☐

**IDENTIFY SAFE PLACES & ESCAPE ROUTES**



☐

**EVACUATE CHILDREN, PERSONS IN NEED OF ASSISTANCE AND -IF NECESSARY- YOURSELF.**



Developed by:

**Flood Competence Center**  
**HKC**  
Hochwasser  
Kompetenz  
Centrum e.V.

**PARADES**  
Forschungsbereich  
für  
Hochwasser  
Schutz  
und  
Management



## Emergency bag

No. 2



The emergency bag shows examples of items that should be on hand in the event of a flood or other emergency, such as important documents, food, water and emergency communication equipment.

The bag can be grabbed and the building evacuated immediately because all the necessary items have been safely packed in advance.

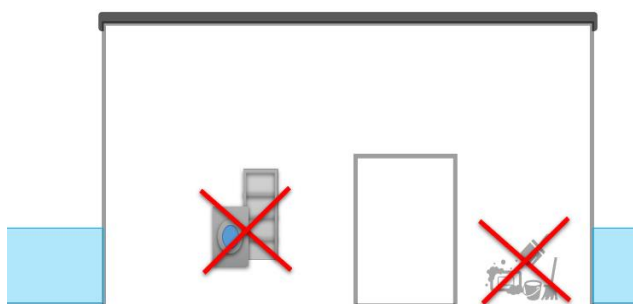
In this way, the emergency bag not only provides assistance immediately after the event, but also creates a calmer evacuation situation at the moment of entry.



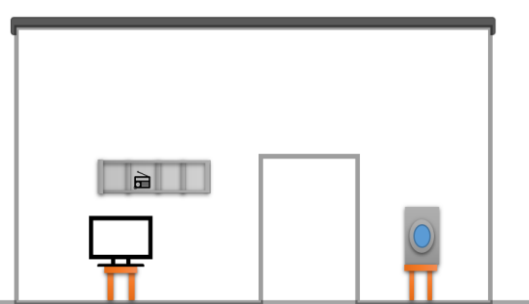
## Valuable objects in flood-prone rooms

No. 3

a)



b)



a)

Valuable objects that could be severely damaged by a flood should be removed from rooms at risk of flooding. It is important to keep documents or objects that have sentimental value. If flooding is expected, rooms that could potentially be affected by flooding should be emptied in advance.

But not only valuable objects and furniture should be removed. It is also important to remove water-polluting substances from the danger zone.

b)

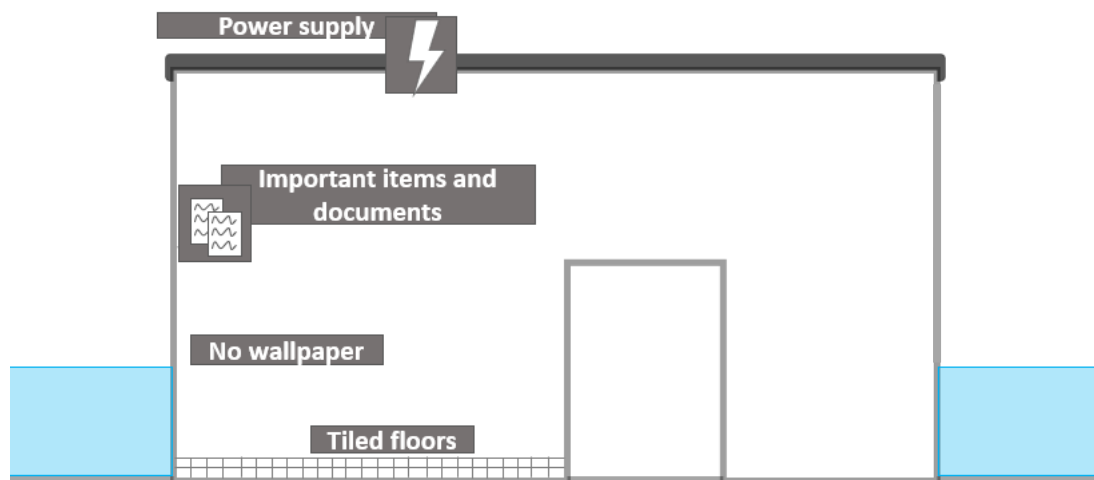
Valuable items, computers and other technical equipment should be stored in an elevated position in the event of a flood in rooms at risk of flooding. For example, these items can be stored in elevated wall shelves so that the water entering the room cannot damage these items.

In the case of heavy or bulky items that may not be able to be transported out of the rooms at risk, there should always be sufficient supports, so that they can be placed on the supports and thus survive the flood in an elevated position.



## Usage of rooms according to the flood hazard

No. 4



To minimize the potential for damage in the event of a flood, the use of the rooms should be designed according to the hazard, so that the rooms can be emptied more easily or provided with furniture that the water cannot damage.

For example, it is important that the electricity supply is distributed from the upper floors to the lower floors, and that the electricity connections in the rooms themselves are not placed near the floor.

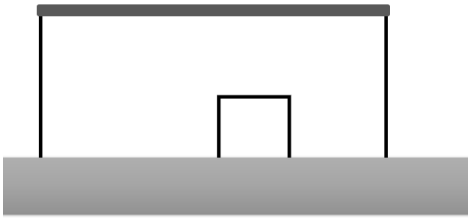
It also makes sense to use waterproof materials in flood-prone rooms, such as tiles instead of wallpaper.



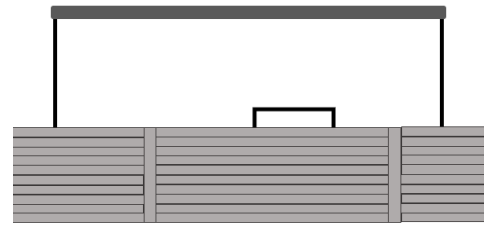


## Barrier-system

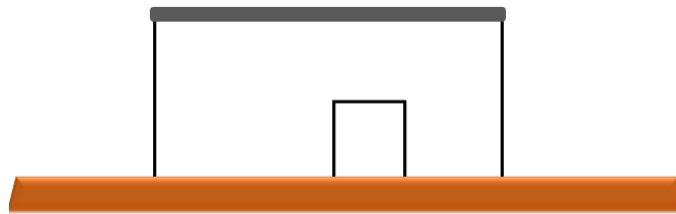
No. 5



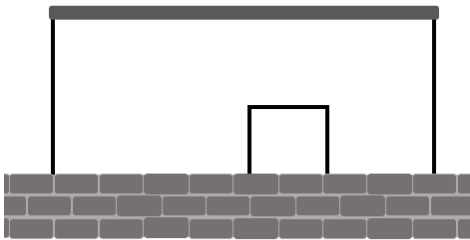
Concrete wall



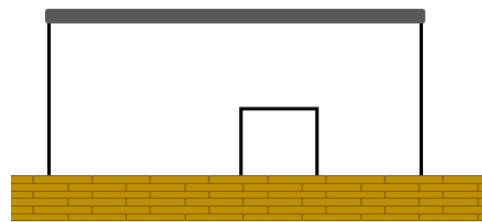
Aluminium beams



Earth wall



Stone wall



Wall from sandbags

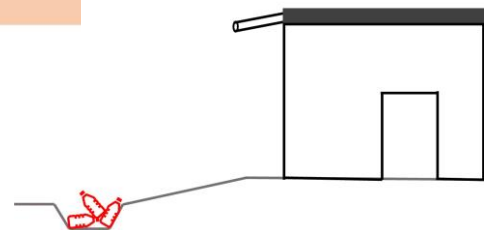
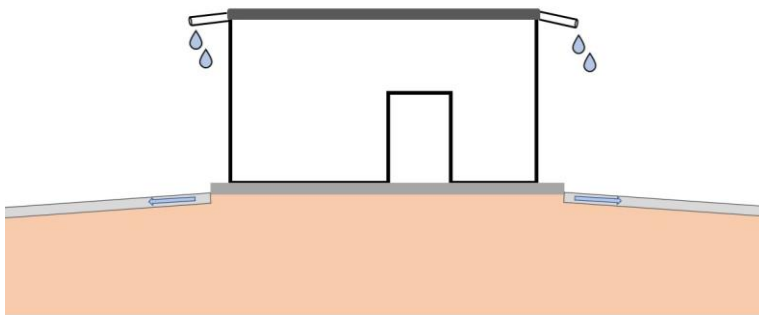


The barrier system can be built in different ways and consist of different materials. To be distinguished are permanent (always present) structures like walls and temporary (built on demand) structures like sandbag dams. However, it must always be ensured that the building is protected on all sides (neighbouring buildings or terrain heights could be included) so that the water cannot reach the building from behind. In addition, the barrier must be stable - especially if the water level is high.



## Water drains away from house

No. 6

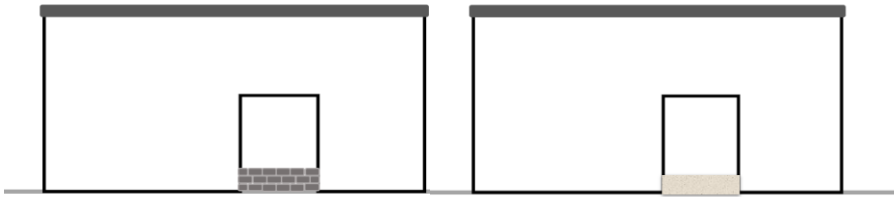


Rainwater falling on the roof is diverted away from the house wall by spouts and then directed away from the building by rain gutters and natural slope. It should not flow towards the building or erode the foundation. Regular maintenance and cleaning is necessary to ensure that the systems are not clogged by leaves or garbage.

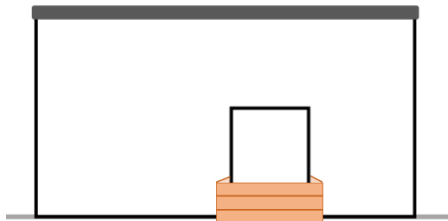


## Measures for ground floor doors

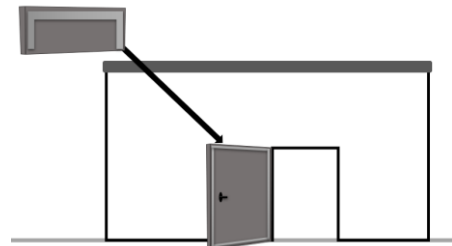
No. 7



a) Upstand



b) Barrier-system



c) Waterproof doors



### a) Upstand in front of ground floor door

A permanently raised threshold made of bricks or concrete (stable and watertight) prevents water from entering as long as the water height does not exceed the height of the threshold.

However, if the water rises higher, it flows over the threshold and can no longer drain away on its own when the outside water level is falling.

### b) Barrier-system in front of ground floor door

To prevent water from flooding the house, temporary barriers can be installed. However, this measure requires advance warning, the necessary time and the necessary manpower to install it.

Such systems can consist of sandbags, wooden boards with seals or other materials. After use, they can be disassembled and reused if necessary.

### c) Waterproof ground floor door

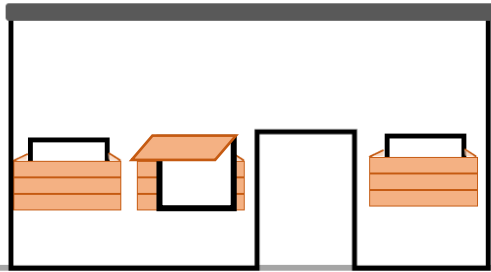
A watertight door (leaf) with a circumferential seal and an associated door frame secures the seal of the door when closed. A corresponding threshold must be provided on the floor.



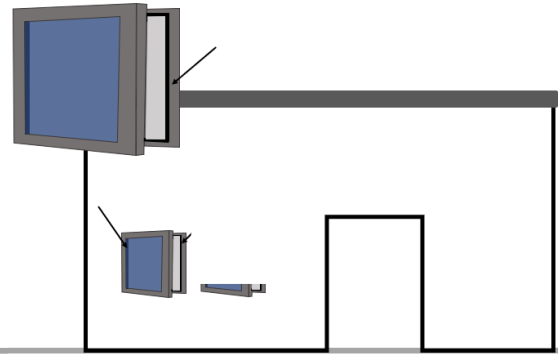
## Measures for ground floor windows

No. 8

a)



b)

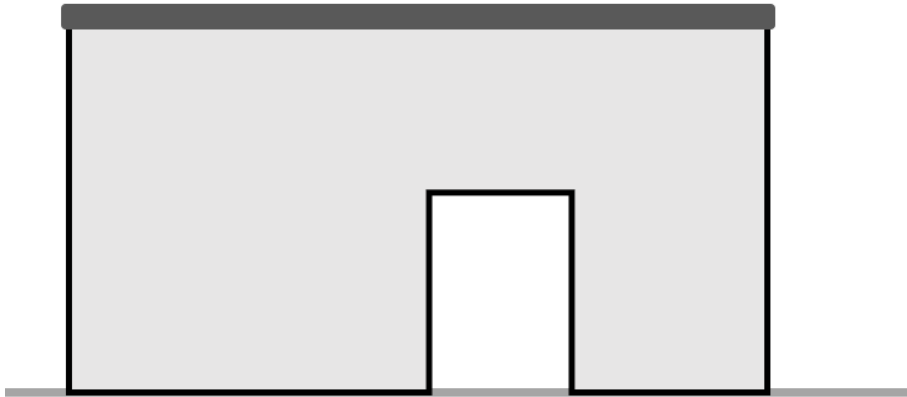


- a) To prevent water from entering through window openings, they are closed with a shield. The shield can be made of various materials such as wooden boards or metal, but it must be able to withstand the pressure of water and must be connected watertight to the house wall at the bottom and to the side. This temporary system, like the door shield, requires advance warning and manpower for installation. This system only makes sense if no other weak points up to the lower edge of the window allow water to flood the house.
- b) Waterproof and pressure-tight windows must be designed for the expected load, i.e., material and construction must withstand corresponding pressures. However, installation only makes sense if no other weak points up to the lower edge of the window allow water to flood the house.



## Waterproof house shell

No. 9

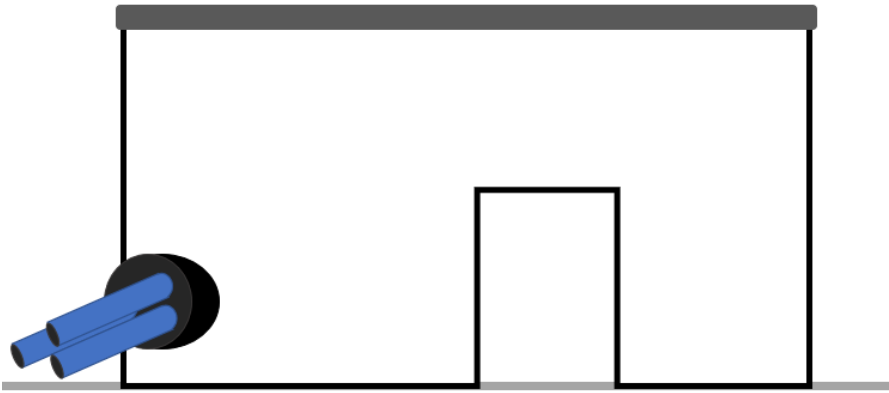


If the outer walls of a building are watertight, the water cannot penetrate the structure and cause damage or even the loss of stability. The walls can be either created from waterproof material, sheathed or coated.



## Waterproof cable conduits

No. 10

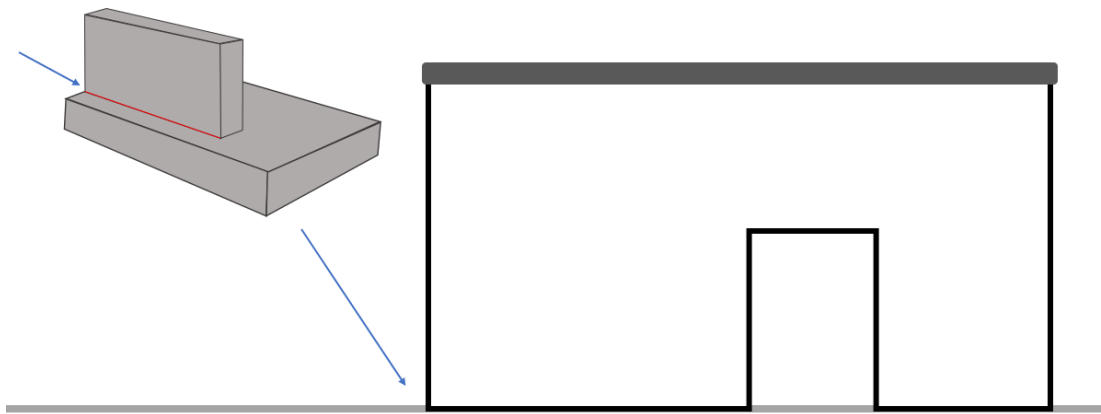


Water finds every path, no matter how small, to get into the building, that is why every cable conduit should be well sealed or placed clearly above extreme water level.



## Waterproof joints

No. 11



The joint where the foundation and wall of a building meet is particularly vulnerable to water ingress.

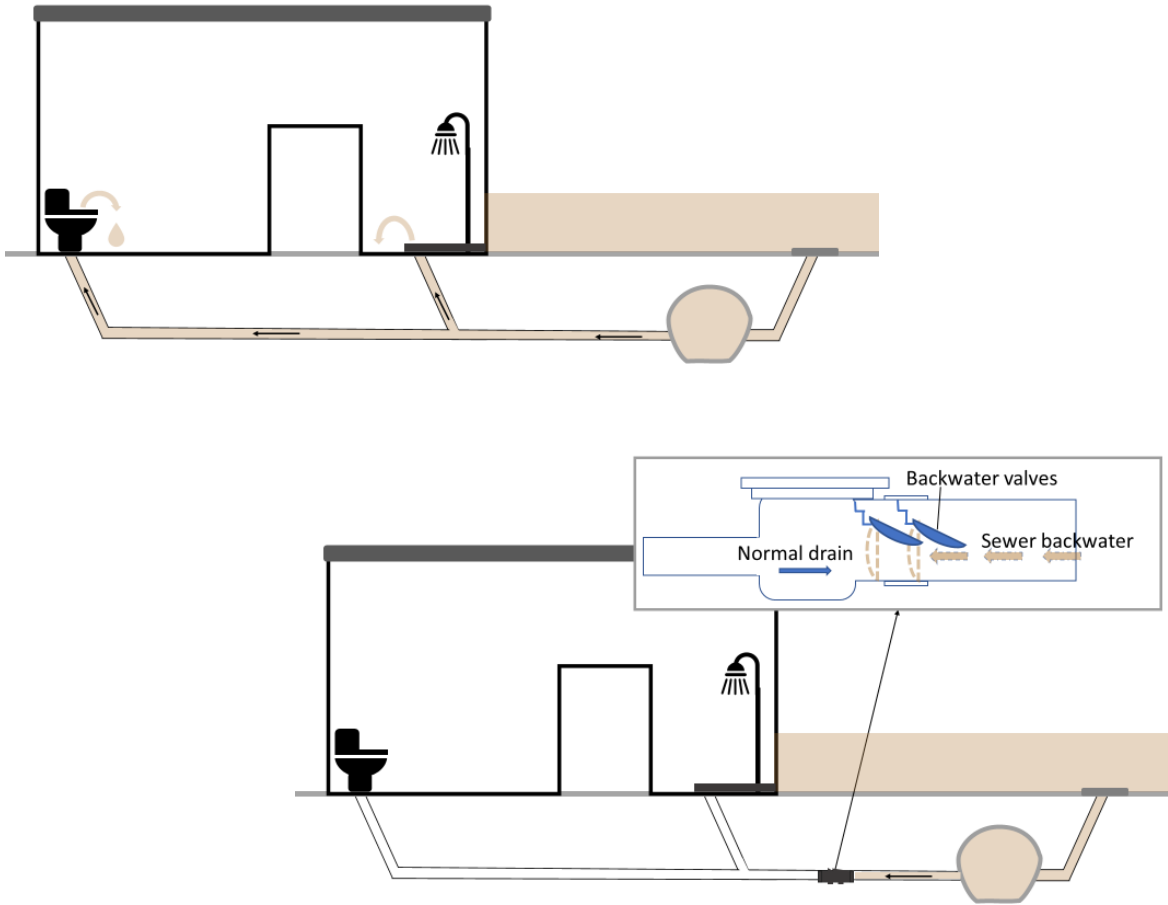
The joints should be sealed to prevent water under pressure from entering the building here.

This joint is particularly critical, as different materials meet here and gaps can occur, due to settlements, for example.



## Protecting the wastewater drainage system against backwater

No. 12



If the house is connected to the sewer system, wastewater can also enter the house via these pipes in the event of flooding if they are not sealed.

Protection can be provided by permanently installed backwater valves, which normally allow the wastewater to flow out, or by manual shut-off devices if necessary.

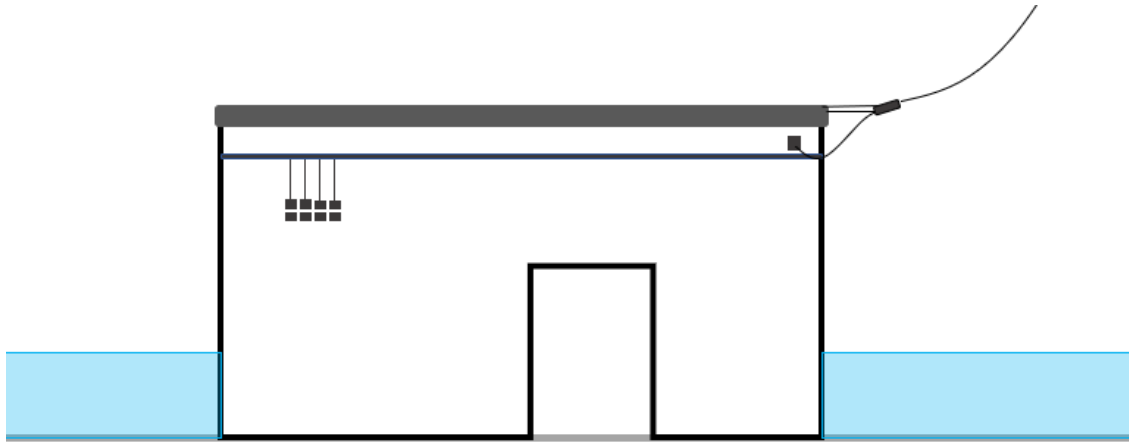
Regular maintenance is essential for the functioning in case of need.





## Raised electrical- and telecommunication connections

No. 13



House connections, circuit distributors and telecommunication connections should be positioned above the highest water level.

If such installations / equipment is flooded, there is a danger to life! Fuses and circuit breakers, which should protect against electric shocks, cannot function properly.

## Decentralized Measures


In addition to technical flood protection and flood preparedness, decentralised measures within the framework of land use management are a central component of flood protection strategies.

They are used with the aim of reducing flood water by increasing infiltration and reducing runoff formation and the associated soil erosion.

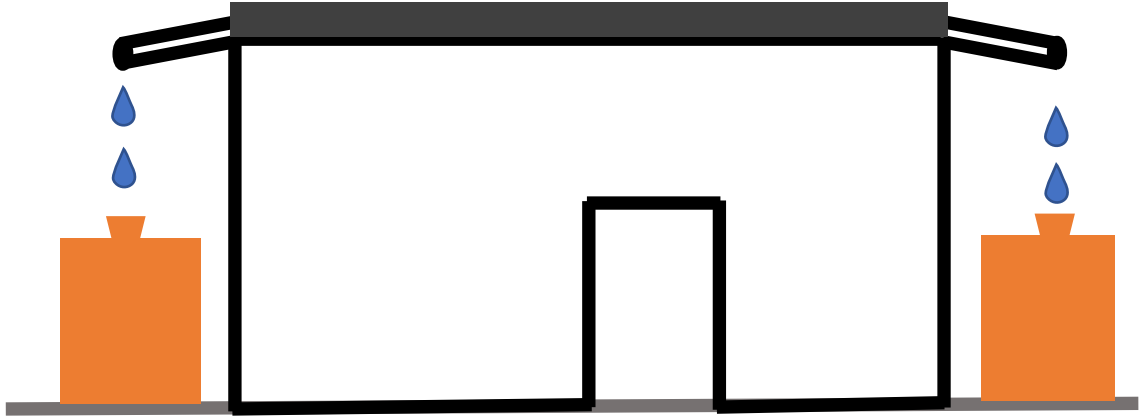
Decentralised measures can be applied in areas of bare land, agriculture land, forests, stream network, flood plains and settlements.


In order to effectively reduce runoff peaks, a large number of decentralised measures must be applied in the catchment area. All decentralised measures are to be regarded as equivalent.

In the following, the specific measures are presented and described:

Storage

No. 14

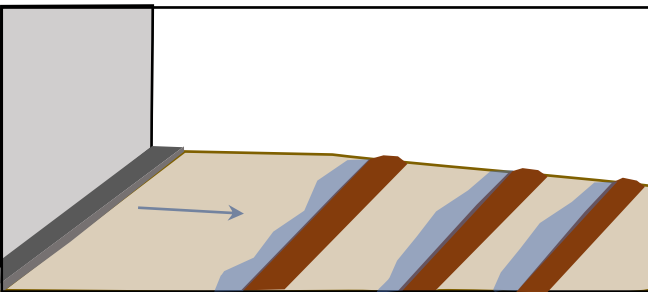
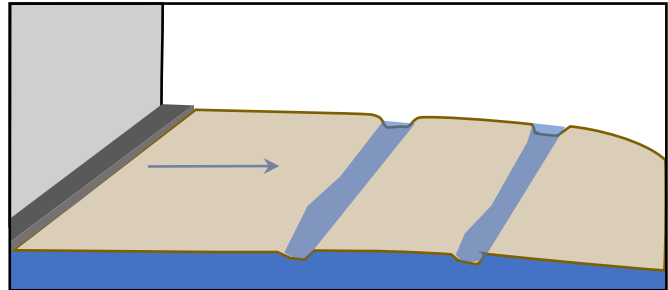
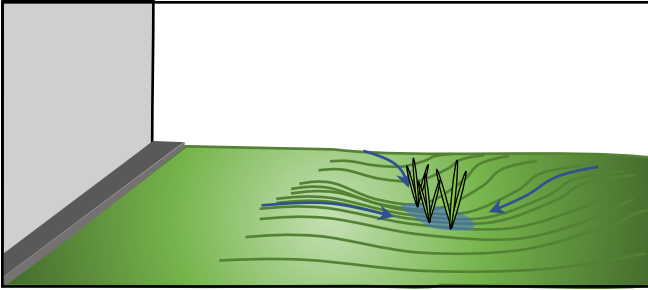




Rainwater can be collected and stored in barrels or other suitable containers for later use. This retained water is thus put to a useful purpose and does not further contribute to flooding.


## Retention


No. 15



Measures to retain or infiltrate rainwater on properties without causing damage reduces the amount of water that runs off on the surface and increases flooding.

Rainwater can be retained and infiltrated on the property by appropriate profiling the terrain.





# **FLOODLABEL**

## **KNOW YOUR RISK AND PROTECT YOUR PROPERTY**

**floodlabel.com**

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