

令和元年 7 月 3 日

仏国「PLAN DE PRÉVENTION DES RISQUES NATURELS D'INONDATION  
COMMUNE DE BOUJAN-SUR-LIBRON  
Catalogue des mesures techniques de réduction de la vulnérabilité」  
(PLAN FOR PREVENTING NATURAL RISKS OF FLOODING  
COMMUNE OF BOUJAN SUR LIBRON  
Catalog of technical measures to reduce vulnerability) 仮英訳

[http://www.boujansurlibron.com/wp-content/uploads/2018/05/PPRI\\_ANNEXE\\_catalogue\\_des\\_mesures.pdf](http://www.boujansurlibron.com/wp-content/uploads/2018/05/PPRI_ANNEXE_catalogue_des_mesures.pdf) (参照：  
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表紙

*Freedom, Equality, Fraternity*

France Republic

Prefect of Hérault

Departmental Direction of  
Territories and Sea Service Water,  
Risks and Nature

PLAN FOR PREVENTING NATURAL RISKS OF FLOODING

COMMUNE OF BOUJAN SUR LIBRON

## Catalog of technical measures to reduce vulnerability

Procedure	Prescription	Public Inquiry	Approval
Elaboration	06/12/2011	from 07/03/2016 to 07/04/2016	31/05/2016

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### Introduction

Although the definitions of risk and hazard are now known, the notions of stakes and vulnerability remain unclear. Under the heading of issues are mainly grouped people, buildings, economic activities, equipment and networks. The term vulnerability refers to the resistance of the property to the event. The vulnerability of the goods depends on their nature (house, warehouse, industrial site, heritage, cultural, etc.), their location and their intrinsic resistance. The more vulnerable a property is, the more predictable damage will be substantial. Indeed, the current building in flood zone does not integrate the risk either in its structure, its facilities and even less in its materials, or its equipment. The construction techniques chosen for economic reasons or lack of knowledge are not adapted to the current, the height and the speed of rising water. The widespread use of fragile and expensive technical equipment (equipped kitchen, hi-fi), the use of water-sensitive materials such as glass wool and the neglect of traditional construction rules have led to a significant increase in vulnerability of buildings.

Mitigation is a state-led policy aimed at ensuring the safety of people and reducing the vulnerability of goods (making the amount of damage as acceptable as possible for society) by advocating simple, effective and consistent measures.

The latter pursue three fundamental objectives:

1. Ensure the safety of people (they can be done by evacuations either by boat or by hoist)
2. Limit damage to property (minimize restoration work)
3. Facilitate a return to normal (this is mainly to limit the time before relocation to the premises and allow it to be carried out under conditions of safety and sanitation. heavy and expensive).

These measures (24 in all) are in the form of synthetic files. The latter were developed following many reflections of a working group led by Claire Boulet-Desbareau, made up of Bruno Bessis (DGUHC), Fabrice Moronval (DPPR), Jean-Luc Salagnac (CSTB) and the club. risk of Languedoc-Roussillon.

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These measures are intended to identify the possible weak points of a building during a flood. The editorial choice that has been chosen favors these prescriptions in terms of performance, with the fewest details concerning their technical translation. Their condition of implementation as well as the technical measures which make it possible to respect them have been, if necessary, relayed in appendices. These technical data sheets (not exhaustive and intended mainly for residential buildings), are taken from a technical guide entitled "Safety of people in existing buildings" developed in 2004 at the request and with the assistance of the management Pollution Prevention and Risk Prevention of the Ministry of Ecology and Sustainable Development. However, scientific and technical knowledge does not yet permit the promotion of vulnerability reduction measures for all elements of a construction. In particular, the behavior to flood, and therefore the resistance, of some materials used in the realization of works such as partitions or insulation is now unknown ... No laboratory test nor standardization exists today. Only the humidity is the sprinkling of droplets for a few hours is taken into account, in no case immersion for several hours or even days. These themes will not be addressed in this catalog. No recommended measures will refer to it. We will rightly point out that there are no ready-made rules to accurately define mitigation measures adapted to all situations without prior study. In the interest of efficiency and relevance, it will be advisable to recommend in addition to the measures, a diagnosis of vulnerability of the building.

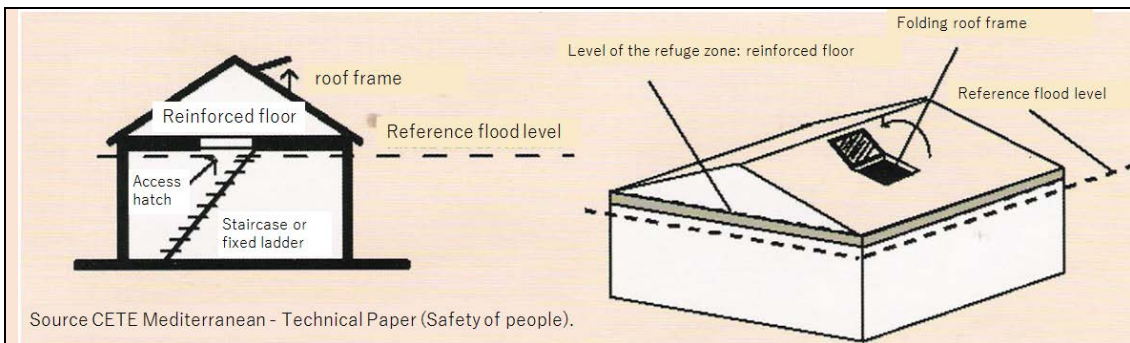
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## 1. Ensuring the safety of people

### Facilitate putting people out of the water and waiting for help

<b>MEASURE1 Identify or create a refuge area</b>
<b>Interest of the measure</b>
<p>The objective of the refuge zone is to allow the occupants of the building to take shelter while waiting for evacuation or recession. For this purpose, it is necessary to identify or create a space above the reference flood * fixed by the PPR * plus a safety margin set by the instructor service. The design of the refuge area should allow people to come forward with rescue teams. She must:</p> <ul style="list-style-type: none"> <li>• be easily accessible for residents by an internal staircase, or even a ladder always available,</li> <li>• offer satisfactory security conditions (possibility of calling or signs to the outside).</li> </ul>

<p>From the refuge area, people must be able to come forward to rescue teams.</p> <ul style="list-style-type: none"> <li>• offer minimum comfort (space),</li> <li>• be easily accessible from the outside for rescue intervention and evacuation of people.</li> </ul> <p>Note that there is not systematically evacuation of all flooded homes. Some people will sometimes have to wait for the recession for several hours, hence the need to have a suitable refuge area.</p>
<p>Conditions of implementation</p>
<p>The refuge area must be sized according to the number of inhabitants in the dwelling with a minimum area of 6m<sup>2</sup> and 1 m<sup>2</sup> per person. The minimum height to allow to wait under correct conditions is 1.20m.</p> <p>The floor must support the extra load caused by the occupants of the house and a lifeguard. It may then be necessary to strengthen the floor.</p>
<p>Permanent measurement / Heavy work.</p> <p>Planning, construction and town planning measure (pay attention to consistency with PLUs).</p> <p>Collective or individual measure.</p> <p>Measure that can be generalized to future constructions.</p>
<p>Limit of use</p>
<p>Some homes can be fully submerged under water. They must be examined in detail. Municipalities must then make specific provisions in their municipal plan of safeguarding (article 13 law No. 2004-811 modernization civil security of August 13th, 2004) and, in the most extreme cases, an expropriation or an amicable acquisition will have to be envisaged.</p>
<p>Application fields</p>
<p>For floods with high water levels.</p>
<p>Accompanying measures</p>
<p>All measures to facilitate the evacuation of persons.</p>



※ (COMMUNE DE BOUJAN-SUR-LIBRON, Préfecture de l'Hérault 2011) 5 頁より作成。

Warning: in seismic zone, any modification of the frame requires a strict respect of seismic construction rules.

#### Financial aspect

In case of creation of net floor area \* (see appendix), the tax implications are those concerning new constructions: housing tax, property tax, departmental tax of sensitive natural areas (TDENS), local tax of equipment (TLE) and if applicable, departmental tax of the council of architecture, urban planning and environment (TDCAUE), the order of magnitude of the cost of the realization of a refuge area of 6 m<sup>2</sup> is indicated below according to the types of framework:

- For a traditional framework: reinforcement of the floor by insulating panels, installation of an access door to the attic \*, a milling ladder \* with its ramp, a chassis \* roof: 3000 to 4000 euros.
- For a carpentry frame \*: removal of the cover on two bays of farmhouses \*, removal of a farmhouse, doubling of farmsteads \*, recovery of the roof \*, reinforcement of the floor by insulating panels, access door to the attic \*, milling ladder \* and wooden ramp, roof frame \*, painting: 4500 to 6000 euros.

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Facilitate putting people out of the water and waiting for help

Measure 2

Create a roof opening

Interest of the measure

In the context of rapid floods or torrential floods evacuations by boat are difficult to envisage because they are considered too dangerous. It may also happen in other cases that no opening is accessible by boat. As a result, hoisting is often the only possible solution.

**Conditions of implementation**

The roof frame with a minimum surface area of 1m<sup>2</sup> to allow the simultaneous hoisting of two persons must be able to fold entirely on the roof. The roof frame and the hatch between the attic and the ground floor must be close. Indeed, the rescuer who accesses the roof must easily locate this hatch if it is necessary to go for a person still on the ground floor.

Permanent measurement / Heavy work.  
 Development, construction measure.  
 Individual measurement.  
 Measure that can be generalized to the constructions dutures.

**Limit of use**

Some homes are not accessible by helicopter, especially those located near the power lines. The communal safeguard plan drawn up by the municipality must take it into account in a specific way. Evacuation by boat should be considered and prepared.

**Application fields**

For floods with high water levels.

**Accompanying measures**

The refuge area must be in line with the evacuation procedures of the people. In addition, many measures around the house are needed to facilitate the approach of the helicopter.

**Measure 3**  
 Create a balcony or terrace

**Interest of the measure**

The device consists of creating a balcony or terrace and a window-type opening communicating with the floor, located above the PHEC.

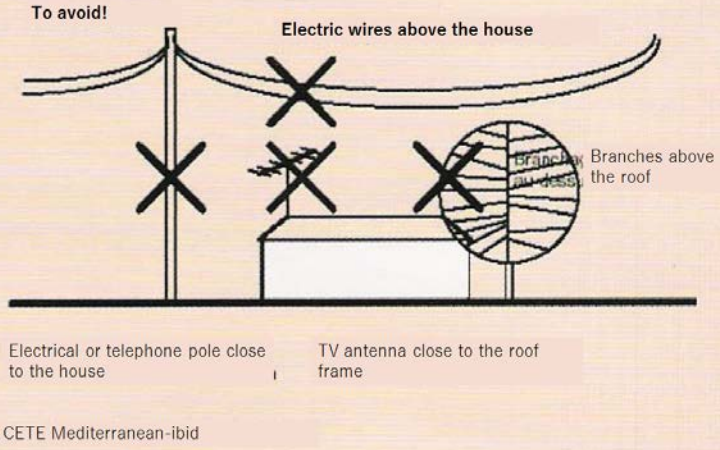
Conditions of implementation
<p>The dimensions of the terrace or balcony can be limited to 1m<sup>2</sup> since people are safe inside.</p> <p>The interior configuration of the house must allow easy communication with the balcony.</p> <p>Permanent measurement / Heavy work</p> <p>Construction and town planning measure (attention to coherence with PLUs)</p> <p>Collective or individual measure,</p> <p>Measure that can be generalized to future constructions</p> <p>Requires the intervention of a professional (work permit).</p>
Limit of use
<p>In certain cases, it may be necessary to derogate from the urban planning rules in force.</p> <p>The constraints regarding sight servitudes (Civil Code) must be respected if the balcony or terrace is permanently accessible.</p>
Application fields
For floods with high water levels.
Accompanying measures
The refuge area must be in line with the evacuation procedures of the people. In addition, many measures around the house are needed to facilitate the approach of the helicopter.

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Measure 4 Install Mooring Rings for Boat Evacuation
Interest of the measure
A mooring ring allows rescuers to attach a boat to evacuate the inhabitants, or refuel them.
Conditions of implementation
<p>The mooring hooks will be sealed in the masonry at different heights to allow relief to hang the boat regardless of the height of the water.</p> <p>The hooks will be installed near the balcony or window where the evacuation will take place.</p> <p>Permanent measurement / Work that can be heavy depending on the type of masonry.</p> <p>Management measure.</p> <p>Individual measurement.</p> <p>Measure that can be generalized to future constructions.</p>
Limit of use
Privilege the installation of a bar with a ring that moves along to overcome the difficulty of evaluation of the installation height of the ring (and therefore the height of water).



Application fields
For any type of flood as soon as the water heights justify evacuation of people.
Accompanying measures
Shelter area, access to the outside: balcony, window or outside staircase.

<b>Measure 5 Arrange the Surroundings</b>
Immediate housing
Interest of the measure
This is to facilitate the operations of hoisting by avoiding the obstacles around the house likely to hinder or even endanger the rescuers during their intervention.
Conditions of implementation
<p>The presence must be removed:</p> <ul style="list-style-type: none"> <li>• branches on the roof of the house, especially on the slope where the roof frame is located,</li> <li>• electrical and telephone lines close to the house and especially above the house,</li> <li>• television antennas and chimney stacks near the chassis.</li> </ul>
 <p>The diagram, titled 'To avoid!', shows a cross-section of a house and its surroundings. Several items are marked with a large 'X' to indicate they should be removed or avoided. From left to right: an electrical or telephone pole close to the house; a set of electric wires running above the house; a TV antenna close to the roof frame; and a tree with branches extending above the roof. Labels include 'To avoid!', 'Electric wires above the house', 'Branches above the roof', 'Electrical or telephone pole close to the house', and 'TV antenna close to the roof frame'. The source is cited as 'Source CETE Mediterranean-ibid'.</p>
<p>※ (COMMUNE DE BOUJAN-SUR-LIBRON, Préfecture de l'Hérault 2011) 7 頁より作成。</p> <p>Permanent measure but which requires a regular maintenance (case of the branches) / Works which can be heavy (burial of the electric lines).</p> <p>Planning measure.</p> <p>Collective or individual measure.</p> <p>Measure that can be generalized to future constructions.</p>

Requires the intervention of an electrical or telephone network operator
Limit of use
An application is required from the dealers.
Application fields
For floods with high water levels.
Accompanying measures
The refuge area must be in line with the evacuation procedures of the people. In addition, many measures around the house are needed to facilitate the approach of the helicopter.

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**Ensure the mechanical resistance of the building**

During the flood, the water exerts a very strong pressure on the structures. This pressure can lead to irreversible disorders or even displacement or complete destruction of buildings. This phenomenon can be aggravated when the connection between the foundations and the elevations has not been correctly performed. In order to limit the disturbances, it is necessary to balance the pressures between the outside and the inside of the building. This translates in practice into a free flow of water inside the building, when it reaches a certain height. Similarly, the stability of the building is also ensured by the foundations. It may therefore be necessary to strengthen the connections between the foundations and the structure to prevent the building from sinking. This situation is mainly encountered in the speed-up points of the flows.

Measure 6 avoid scour
Foundations
Interest of the measure
It is a question of avoiding the disorders caused to the structure of the building by the pressure of the water. In particular, this measure aims to protect the superficial foundations from the risk of scouring, and then their eventual loosening by the installation of a concrete spade.
Conditions of implementation

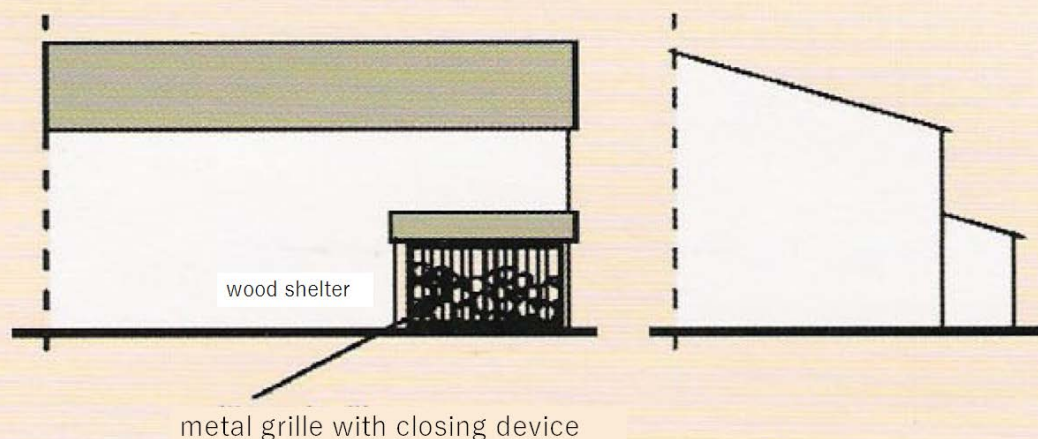
<p>A concrete spade protects the foundations upstream of the predictable flow. A reinforced concrete pavement covering (pavement) joining the spade to the facade and having a slight cut-slope avoids the risk of soil digging by the water downstream of the spade. The distance between the spade and the footing is a function of the width of the drainage jacket. The slope must avoid a decompression of the ground at the level of the foundation.</p> <p>Permanent measurement / Heavy work.</p> <p>Construction measure.</p> <p>Individual measurement.</p> <p>Measure that can be generalized to future constructions.</p> <p>Requires the intervention of a professional (work authorization).</p>
Limit of use
Nothingness
Application fields
For fast, even torrential floods with high water levels.
Accompanying measures
Nothingness

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**Ensure the safety of the occupants and the residents in case of maintenance in the premises**

<b>Measure 7 Prevent the Flotation of Objects Interest of Measurement</b>
Interest of the measure
Reserves of firewood and light buildings can be washed away. They then become dangerous floating objects that can strike the lifeguards and damage walls, cofferdams, patio doors in waterfront buildings.
Conditions of implementation

Objects likely to be carried away by the waves must be protected from the current. The firewood reserves can be covered with a tarpaulin firmly anchored to the ground. Heaps of wood can be held with straps securely stretched and anchored to the ground.



Source CETE Mediterranean-ibid.

※ (COMMUNE DE BOUJAN-SUR-LIBRON, Préfecture de l'Hérault 2011) 9 頁より作成。

Permanent or temporary measure / Light work.

Measure of construction, development.

Individual measurement.

Limit of use

The attachment points of the tarpaulins or straps must withstand the force of the water (sealed hooks). The protection by a tarpaulin will present the interest of keeping your wood sheltered from the rain.

Application fields

All floods, whether fast or slow, regardless of the water level.

Accompanying measures

nothingness

Measure 8 Materialize the footprints of in-ground pools and basins

Interest of the measure

In case of flood, pools and ponds are no longer visible due to the turbidity of the water. There is therefore for rescuers, a significant risk of drowning because of the significant depth. This involves installing a marking device to identify the footprint of pools and ponds.
<b>Conditions of implementation</b>
Beacons of color and shape facilitate their identification delimit the perimeter of pools and ponds. Beacons must be permanently attached. Permanent measurement / Light work. Measure of construction, development. Individual or collective measure. Measure that can be generalized to future constructions.
<b>Limit of use</b>
Nothingness
<b>Application fields</b>
For floods with high water levels.
<b>Accompanying measures</b>
Since January 1, 2004, newly constructed private individual or collective burial private pools must be equipped with a safety device that meets specific safety standards.

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16- Title II of 1<sup>st</sup> Book of the Construction and Housing Code, Chapter VIII-Safety of swimming pools.

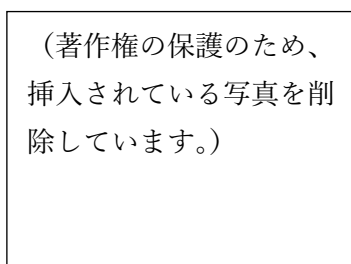
10 頁

## **2. Limit damage to property**

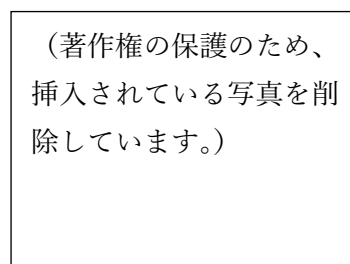
### **Limit the penetration of polluted water into the building**

<b>Measure 9 Strengthen the stowage of oil tanks and bottles</b>
<b>Interest of the measure</b>

<p>The tanks of gas or fuel, in case of bad anchoring, are raised under the effect of the Archimedean thrust exerted by the water and start to float. They can then be swept away by the current, becoming dangerous floating objects. In addition, their content can spread, either because it has turned over, or because the connection pipes are disengaged from the tank.</p> <p>Such a hydrocarbon pollution can permanently damage a whole set of houses given the smell of fuel that durably impregnates the masonry.</p>
<p>Conditions of implementation</p>
<p>This measure is subject to a standard that takes into account the risk of flooding<sup>17</sup>. It may be advisable to keep the tank sufficiently filled to improve resistance to buoyancy.</p> <p>Permanent measurement / Heavy work. Management measure.</p> <p>Individual or collective measure. Measure that can be generalized to future construction.</p> <p>Requires the intervention of a professional.</p>
<p>Limit of use</p>
<p>Masonry blocks in which tank anchors and strapping are attached must be sufficiently strong. In areas identified as seismic, it is best to bury the tanks.</p>
<p>Application fields</p>
<p>All floods, whether fast or slow, as soon as the water height becomes significant (a few tens of centimeters)</p>
<p>Accompanying measures</p>
<p>It is essential to complete the anchoring device by installing valves and shut-off valves. These cut-off devices can be installed on the tank, or on the connections to the housing networks. They must be clearly identified by the individual.</p>



Tank lifted by the water.



Polluted hedge

Source: MEDD-DPPR-Floods in Bellegarde- December 2003

17- Order of the Ministry of Industry dated 30 July 1979, concerning the technical and safety

rules applicable to fixed liquefied hydrocarbon storage facilities not subject to the legislation of classified installations or public buildings. It was amended by order of 5 February 1991 and published in the OJ on 27 February 1991.

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Limit the penetration of water into the building

Measure 10 Install cofferdams (flood barriers)
Interest of the measure
Cofferdams are flood barriers that are installed on doors and windows or away from the dwelling to minimize or delay water penetration, allowing more time to elevate or move furniture. If it is impossible to prevent water from entering, the cofferdam avoids the entry of sludge, allowing only filtered water to flow, which will facilitate cleaning.
Conditions of implementation
System adaptable to any type of opening. Their storage must be adapted in order not to alter their performance. Temporary measure / Light work. Measure of construction, development. Individual or collective measure.
<p>Slide the board into the frame set in front of the entrance</p> <p>A hinge could allow to open the cofferdam</p> <p>You can use the cofferdams to also protect your garage doors or gates</p> <p>board</p> <p>board</p> <p>board</p> <p>Framing</p> <p>seals</p> <p>Framing</p> <p>board</p> <p>Source: www.prim.net</p>
※ (COMMUNE DE BOUJAN-SUR-LIBRON, Préfecture de l'Hérault 2011) 11 頁より作成。
Limit of use

<p>They may have trouble resisting a very fast flood with a lot of current. Their effectiveness is limited to a water depth of one meter. They must be able to be spanned by an adult to allow a possible evacuation of the occupants. In addition, above this height, it is necessary to let water into the house to balance the hydraulic pressure. These devices may require a longer or shorter implementation time. The effectiveness of cofferdams, their sealing potential depends on the adhesion of the device to the walls. It is therefore a function of the nature of the walls, and the quality of the joints and fixings. Additional measures may be necessary to prepare the surface of the walls and allow better sealing, to improve the squareness with the ground.</p>
<p>Application fields</p>
<p>All floods, whether fast or slow, regardless of the water level. Their effectiveness is limited to water depths of 1 meter.</p>
<p>Accompanying measures</p>
<p>Non-return valve, displacement of the air ducts or temporary cover for air vent, possible pump, treat the penetrating cracks, shutter of the ducts of the networks.</p>

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<p>MEASURE 11 TO OBTAIN TEMPERATURE DEVICES BY VENTILATION AND VENTILATION PLUGS, ACCESS TRAPPERS TO SANITARY VACUUM</p>
<p>Interest of the measure</p>
<p>These openings located in the walls essential to the comfort of the housing and its wholesomeness are privileged water entries in case of flood. To limit the penetration of water and fines in the housing, it is essential to close these devices. However, it is also essential to remove the protections when relocating to the premises (risk of gas poisoning).</p>
<p>Conditions of implementation</p>
<p>Different devices exist. It can be grid or filter to block the floating objects and as much as possible, while letting the water pass. Lids can be installed on vents and vents. They are fixed by a simple clip or are integrated into a frame.</p> <p>Temporary measure imperative! / Light work Development measure. Individual measurement.</p>
<p>Limit of use</p>



<p>This "closure" must remain temporary. In fact, to facilitate the drying out, to allow the maintenance of the crawl space and the relocation in the places (in good conditions of wholesomeness), the covers or any other device must be removed. Too much water pressure could result in scouring and damage to the structure itself. It is therefore recommended to choose grids or filters for the crawl space access hatches. These grilles must be removable to allow the maintenance of the crawl space when possible.</p>
<p>Application fields</p>
<p>All floods, whether fast or slow, regardless of the water level.</p>
<p>Accompanying measures</p>
<p>Cofferdams, clogging of ducts of networks.</p>

<p><b>MEASURE 12</b> <b>CLOSING THE SHEETS OF THE NETWORKS</b></p>
<p>Interest of the measure</p>
<p>The electricity, telephone or sanitation networks, or drinking water supply that come from the public domain, are laid in ducts that are possible water inlets in case of flood. Water then seeps through the eyes.</p>
<p>Conditions of implementation</p>
<p>Corks exist. They will ensure you a good seal of these looks. Permanent measurement / Light work. Management measure. Individual measurement. Requires intervention of a professional.</p>
<p>Limit of use</p>
<p>nothingness</p>
<p>Application fields</p>
<p>All floods, whether fast or slow, regardless of the water level.</p>
<p>Accompanying measures</p>
<p>Cofferdam, lid for air vent, penetrating cracks to treat.</p>

MEASURES 13 PROTECT GREENHOUSES AND VERANDAS (ALL GLASS SURFACES)
Interest of the measure
Verandahs and greenhouses consist of aluminum profiles or wooden uprights that are easily twisted or broken by water. Glazing can also break under pressure. The water can then easily spread in the housing. Most often, it is best to sacrifice them and recommend their opening by installing the cofferdam on the inner door of the greenhouse.
Conditions of implementation
Install cofferdams to protect the structure and windows. Temporary measure / Light work. Management measure. Individual measurement.
Limit of use
In some cases, it is futile to want to protect the porch and the house. It is better than to install the cofferdam on the door of communication between the veranda and the housing, to sacrifice the veranda to better protect the housing.
Application fields
Low flood, less than one meter high, little current.
Accompanying measures
Remember to temporarily seal the other entries possible such as air vents. The use of a pump can also complete this device.

MEASURE 14 USE A PUMP TO REJECT WATER TO THE OUTSIDE
Interest of the measure
A pump helps to control the water level inside the house. It allows in particular to control the infiltration around the cofferdams and under the building. It also allows faster removal of water after flooding, and thus facilitates cleaning.
Conditions of implementation
Purchase and instructions for use, instructions for use. Individual or collective measure. Temporary measure / Light work.
Limit of use

It is important not to pump too fast at the end of the flood. The soil is still waterlogged and the use of a pump could cause differential settlements around the housing that could destabilize the structure. Pumps used to control water infiltration must not run on electricity, which is cut off during the flood. Its use is recommended but it must be well dimensioned and installed at a low point. The evacuation of water must be provided. Its action is harmful when there is too much water (balancing the differential pressure). So it can be useful to pump to control the level, but not necessarily remove everything.

Application fields

All floods, whether fast or slow, regardless of the water level.

Accompanying measures

Install a peripheral drain, cofferdam, cover, any device to limit the penetration of water.

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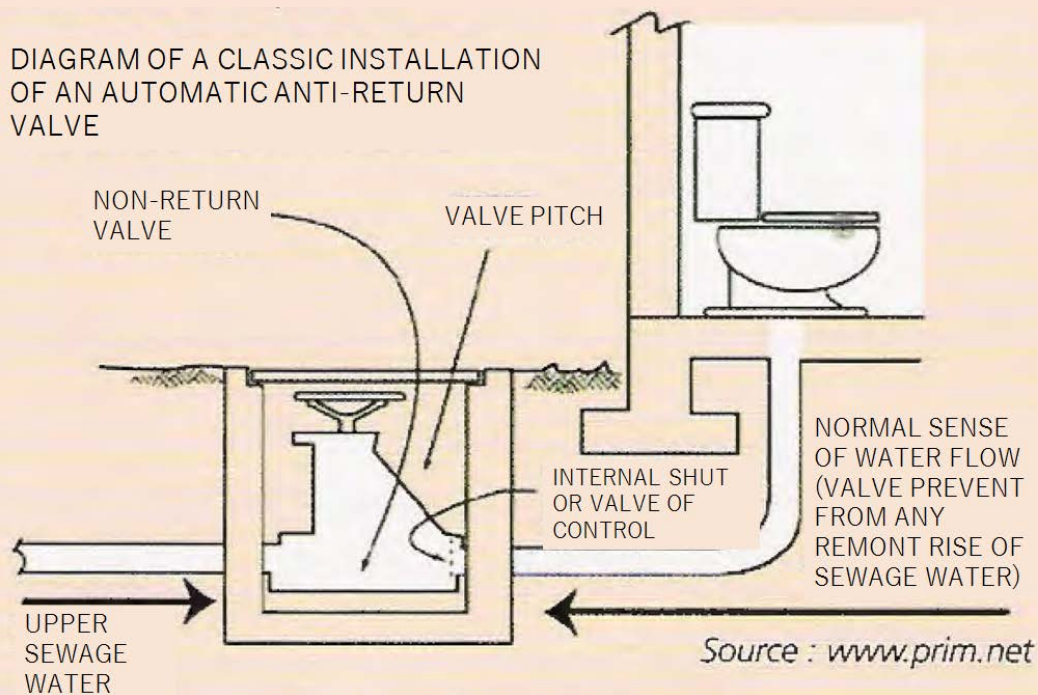
MEASURE 15 INSTALLING ANTI-RETURN VALVES

Interest of the measure

Water can flow through drains, toilets, and sewer lifts. The water is then contaminated and dirty. The home can then experience problems of nauseating odor and health that cause significant cleaning difficulties. It is therefore a priority to prevent this dirty water from entering.

Conditions of implementation

Lift the plate up and check for the presence or absence of the backflow preventer. Different models exist. Provide annual maintenance of the valve.



※ (COMMUNE DE BOUJAN-SUR-LIBRON, Préfecture de l'Hérault 2011) 14 頁より作成。

Permanent measurement / Light work. Management measure. Individual measurement. Requires intervention of a professional.

#### Limit of use

Too many valves on the same network can allow the latter to put overpressure in case of flood (water entering large quantities in the pipes not sufficiently dimensioned). Pipes can then jump on the streets. The dirty water will then come in through walls, windows and doors. Regular maintenance by a building professional is essential.

#### Application fields

All floods, whether fast or slow, regardless of the water level.

#### Accompanying measures

Accompanying measures: cofferdam, cover for air vents. The owner will have to check the capacity of the pipe to resist the overpressure created.

#### Choose equipment and construction techniques

<b>MEASURE 16 USE THERMAL INSULATION WITH LOW WATER RETENTION (AVOID GLASS WOOL)</b>
<b>Interest of the measure</b>
Hydrophilic insulators (wool or expanded polystyrene) lose their insulation quality with water or mud. They gorge themselves with water and settle in the bottom of the partitions. An insulator such as extruded polystyrene (closed cell) will retain its properties much better, and need not be changed.
<b>Conditions of implementation</b>
Permanent measurement / Heavy work. Requires intervention of a professional. Construction measure. Individual measurement.
<b>Limit of use</b>
Very technical work, not always possible. If the removal of old insulation is possible, the installation of new materials can be difficult.
<b>Application fields</b>
Fields of application: All floods, whether fast or slow, regardless of the water level.
<b>Accompanying measures</b>
nothingness

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<b>MEASURE 17 AVOID THE PARTITIONS IN PLASTERBOARD</b>
<b>Interest of the measure</b>
There are several types of drywall. For housing in a flood zone, prefer water-resistant plasterboard (green) that will withstand short-term floods and should not be systematically changed. The horizontal installation of the plates will allow that in case of flood of low height, only that located at the bottom is touched and therefore replaced.
<b>Conditions of implementation</b>
Install "water-repellent" plasterboard partitions (blue or green plates) on a metal or wood frame or double the existing partitions with water-resistant plasterboard
Permanent measurement / Heavy work. Construction measure. Individual measurement. Requires intervention of a professional.

Limit of use
The materials composing the partitions have water reactions, both in the short term and over time, which are still poorly evaluated. In the case of very long immersion, even a waterproof plasterboard will be damaged.
Application fields
All floods, whether fast or slow, regardless of the water level.
Accompanying measures
Take advantage of the change of the partitions to take some measurements on the electrical network.

<b>MEASURE 18 INSTALL PVC JOINERY</b>
Interest of measurement
PVC exterior joinery is insensitive to water. As they are composed of profiles, however, we must pay attention to the possible entry of water into the carpentry. However, PVC can suffer from exposure to certain pollutants carried by water.
Conditions of implementation
Have PVC exterior joinery with a galvanized steel core. This steel core makes the window more solid. It is mandatory to file a declaration of work in the town hall.
Permanent measurement / Heavy work. Construction measure. Individual measure Requires intervention of a professional.
Limit of use
Conditions of use: Limit of use: As they are composed of profiles, however, it is necessary to pay attention to the possible entrance of water through the joinery. However, PVC can suffer from exposure to certain pollutants carried by water.
Application fields
All floods, whether fast or slow, regardless of the water level.
Accompanying measures
nothingness

### 3. Facilitate the return to normal

This is mainly to limit the time to repossess the premises under satisfactory sanitary and security conditions.

#### Facilitate the restarting of equipment

Technical equipment such as heating or electricity is particularly vulnerable to the effects of water. They are essential for a good relocation in places as soon as the water is removed. Reclamation work can be heavy and expensive. A boiler is most often irreparable after a flood. Stagnant water in an electrical pipe makes it dangerous and unusable.

MEASURE 19 REMOVE THE ELECTRIC PANEL OUT OF WATER
Interest of the measure
Avoids a possible replacement. Avoids malfunctions like short circuits.
Conditions of implementation
Place them 50 cm above the level of the highest known water line, or even upstairs. Permanent measurement / Heavy work Development measure Individual measure Requires professional intervention
Limit of use
None. It must be remembered, however, that grid operators will cut off power supply throughout an area as soon as the presence of water is reported. Even a house that is not flooded can be deprived of electricity.
Application fields
All floods, whether fast or slow, regardless of the water level.
Accompanying measures
Downstream electrical network.

MEASURE 20 CREATING A DOWNLINK ELECTRICITY NETWORK
Interest of the measure

Facilitates the evacuation of water in the lines, avoids the stagnation of the water and thus the malfunctions, avoids having to replace them and thus to deteriorate (to open) the partitions.
Conditions of implementation
The networks must come down from the ceiling and the upper parts of the dwelling. The connection to public networks must therefore be installed at the ceiling level. Permanent measurement / Heavy work. Management measure. Individual or collective measure for buildings. Requires intervention of a professional.
Limit of use
The wiring and the circuit must not contain siphons.
Application fields
All floods, whether fast or slow, regardless of the water level.
Accompanying measures
Put the electrical panel out of the water, raise the electrical outlets above the PHEC (valid for frequent and small floods, does not require a major modification of the electrical network).

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<b>MEASURE 21 CREATING A SEPARATE ELECTRICAL SYSTEM FOR FLOODED PARTS</b>
Interest of the measure
Allows to limit the damage to the flooded area (no rise by capillary water), allows to recover electricity in an area saved from the flood (the circuit having suffered damage for example on the ground floor is turned off by a circuit breaker), facilitates drying, cleaning the damaged area, allows reinstallation in normal conditions of comfort (heating, electricity ...) can repair a slower pace, the comfort being present in some areas of the house.
Conditions of implementation
Separate networks must be made by differentiating between flood and non-flood zones (eg one per floor). Install a circuit breaker on the flooded part of the electrical network (allowing it to be de-energized while supplying the non-flooded area!) Permanent measurement / Heavy work. Management measure. Individual or collective measure for buildings. Requires intervention of a professional.
Limit of use



The division of the network into different zones must be reflected, the known flood scenario and integrate into the latter.
<b>Application fields</b>
All floods, whether fast or slow, whatever the water level.
<b>Accompanying measures</b>
Turn off the electrical panel, install 30 mA differentials on the electrical network of the flood zone (very sensitive circuit breakers that will ensure greater safety when returning electricity).

<b>MEASURE 22 OFF WATER HEATING FACILITIES, VENTILATION AND AIR CONDITIONING PLANTS</b>
<b>Interest of the measure</b>
These equipments are expensive and long to replace. They will facilitate the drying out of housing, especially walls. Such a measure avoids malfunctions due to humidity or the entry of water into this equipment.
<b>Conditions of implementation</b>
Install this equipment in non-floodable areas of the dwelling, such as the attic or the attic Permanent measurement / Heavy work. Management measure. Individual or collective measure for buildings. Requires intervention of a professional.
<b>Limit of use</b>
In case of suspended installation, it is necessary to take seismic precautions in the areas concerned by this risk. It is also possible to keep the current installation with some adaptations, such as waterproof insulation. It is also possible to modify only its positioning. Connections to the network will have to be considered. The PPR will be able to choose between these three alternatives.
<b>Application fields</b>
All floods, whether fast or slow, regardless of the water level. Even low height can have a significant impact on these facilities if they are affected.
<b>Accompanying measures</b>
None.

<b>MEASURE 23 INSTALL DOORS AND DOORS-WINDOWS WITH LOW HEIGHT</b>
Interest of the measure
The absence of a threshold facilitates the evacuation of cleaning water from one room to another, from one room to the outside.
Conditions of implementation
Permanent measurement / Heavy work. Management measure. Individual measurement. Requires the intervention of a professional (work authorization)
Limit of use
None.
Application fields
For floods with high water levels.
Accompanying measures
nothingness

### Facilitate drying

<b>MEASURE 24 INSTALLING A PERIPHERAL DRAIN</b>
Interest of the measure
The underground drains, placed on the periphery of the building, allow a faster drying of the walls of the house. Indeed, the water will be collected and evacuated far from the walls, avoiding that it stagnates and that humidity settles.
Conditions of implementation
Make a trench all around the house, insert the drain. Consider the nature of the soil, and the slope of the natural terrain. Provide for connection to the sewage system. Measure to adapt to the nature of the soil. Permanent measurement / Heavy work. Management measure. Individual or collective measure for buildings. Requires intervention of a professional.
Limit of use
This may be unnecessary in clay soils that are very impervious to water.
Application fields
All floods, whether fast or slow, regardless of the water level.
Accompanying measures
None.