

Climate Change Resilience: Data Centres

Template for flood risk plan

Introduction

A flood emergency response plan should set out the preparations needed to respond to flood incidents (people and resources) and the procedures that should be implemented. An effective flood plan will contain commercially sensitive information and important details relating to site security and therefore should remain confidential.

The plan should include the following

- Identification and appraisal of the flood hazard, including information sources
- Survey of building and categorisation of the flood risk affecting critical areas
- Preparation
- Emergency management structure
- Action plans for dealing with different categories of floods and the subsequent clear up
- Post event analysis

Supporting information should also be available:

Appendix A	Understanding local flood hazards (an example is included for London Docklands)
Appendix B	Key equipment and supplies that should be in place
Appendix C	Likely water damage to plant items that are affected by flood
Appendix D	Health & safety considerations in dealing with floods
Appendix E	Guidance on deployment of protective measures (sand bags and flood board)

1.0 Understand and evaluate the flood hazard relevant to the location.

- Understand relevant flood types – coastal, fluvial, pluvial, plus tidal surge, surface water runoff, other local factors. (There is a large data centre cluster in London so Appendix A includes notes specific to tidal surges and flooding to the Thames basin).
- Familiarise staff with existing hard defences and other public flood protection. See Appendix A for notes on the Thames Barrier
- Ensure that relevant sources of information are being used (Met Office, Environment Agency, Water company, barrier/barrage/lock/weir controller, Energy provider)
- Ensure that the correct information is being accessed and used to inform decision making (Flood alerts, forecasting, advanced hazard warnings)
- Be aware of times where risk is higher / seasonal variations in risk
- Ensure that different flood scenarios have been explored and envisaged.

2.0 Building survey

A building survey should be conducted to record the location of critical plant with respect to potential water levels.

2.1 Annotated building elevation

- An annotated elevation, if necessary supported by an indicative plan, should be produced.
- A key reference level should be identified and the relative height of all plant /critical assets should be included on the elevation, plus information regarding access.
- External reference levels (e.g. for nearby water bodies) should be included.
- An inventory of critical plant at each level should be compiled.

SCALE or ANNOTATED DIAGRAM SHOWING BUILDING ELEVATION AND FLOOR LEVELS, VERTICAL LOCATION OF ALL KEY PLANT AND ANY RELEVANT KEY REFERENCE POINTS IS ESSENTIAL

2.2 Assessment of flood risk (for each floor/level):

- At what point above reference level would the level/floor be breached by flood water?
- How much water could accumulate and have to be pumped out (M^3/L)?
- Type and condition of external drainage to building – surface, gravity / pumped?
- Destination of drain water, priority rating of termination point for water
- (some pumping stations are considered priority and will be backed up by generator)

2.3 Survey of each floor level

- Floor height relative to key reference points.
- Indicate what kind of walling – block, partition etc.
- Access and emergency access
- Situation of plant: enclosed or open?
- Plinthed or frame mounted? Height of plinth /frame?
- Generators: indicate levels of Alternators, air intake, fuel intake, exhaust
- Oil storage: indicate level of filler nozzles, capacity and lowest likely capacity
- Existing water protection/ internal drainage
- Location of any specialist equipment
- Operator responsible for drain terminus (e.g. Thames Water).
- Operator responsible for HV switch room (i.e. energy supplier)

2.4 Plant to include in inventory

- UPS Batteries.
- DC System Batteries
- DC Battery Isolator Panel
- Transformers
- Electrical Distribution & Cabling
- MVA Generator(s)
- Fuel Tank/s
- HV Switch Room(s)
- UPS
- Static Switch(es)
- Transformer Incoming Panel(s)
- Generator Control Panel(s)
- Main Switch Panel(s)

3.0 Preparation

The facility and staff must be prepared so that the emergency flood response plan can be implemented instantly. This includes communicating the information to key people and the advance purchase of equipment and supplies.

3.1 Awareness of senior management

Senior management to board level should be made aware of the potential for flood hazard at the site/s and the existence of the Emergency Response Plan. They need to understand the risks of damage to assets, impact on customers and reputation. Most importantly, responsibility for implementing site shut down plans must be acknowledged.

3.2 Awareness of other key people

All members of the Flood Management Team must be fully briefed on this plan. Awareness of the conditions that can build up into a flood and the ability to proactively prepare are critical. The Flood Management Team will need to be familiar with the emergency equipment, and trained in its use. Training and awareness will also need to be maintained through the use of regular drills. Maintenance of emergency equipment also needs to be considered part of the day to day site operations management.

3.3 Site shut down briefing

A briefing on site shut down needs to be prepared including criteria for implementation and authorisations.

3.4 Equipment to purchase

Equipment identified in the plan (sample list in the appendices) will need to be purchased. An inventory should be prepared and the location of the equipment should be clearly communicated to staff.

3.5 Other preparations

Other site preparations should include flood boards, line markers on walls to indicate depth etc.

4.0 Management structure for incident response

A Flood Management Team should be established; all key staff needed to deal with the incident must be identified, and the list must be maintained to accommodate staff changes.

Home addresses should be included in case any staff are personally affected by flooding

5.0 Emergency response: staged action plans

Establish key reference points for implementing action plans. These could be Environment Agency flood or severe weather warnings, warnings from other sources (Thames Water, Thames Barrier, Met Office), water level measurements in adjacent water bodies (rivers, reservoirs, docks, etc.), rain gauge measurements, water levels in basement or car parks, etc. or known upstream risks.

Action plans should be staged on the basis of the degree to which circumstances are departing from key reference points and on the basis of impacts on assets and functionality as water level rises. It is likely that operators will have several levels of response: low impact incidents will continue normal operation but increase monitoring; a medium-level response will address events of greater severity where the site moves to generator power supply (in anticipation of mains failure) and a severe impact event where the site undergoes controlled shut down. These are explained in more detail below.

5.1 Low Impact (incremental breach of key reference points)

Emphasis: Increase monitoring

Strategy: Ensure the site is fully prepared to escalate response

5.1.1 Receive notification of flood expectation

- Notify key staff
- Check with environment agency on expected extent of flood
- Brief Flood Management Team
- Check initial water level to establish a reference point for further rises
- Implement monitoring
- Check with energy supplier for any planned power supply outages (time of and expected duration)
- Monitor Radio and TV news for updates
- Notify Customer Support of situation

5.1.2 If key reference points are further exceeded

- Escalate to Medium Impact plan

5.2 Medium Impact Plan: (significant breach of key reference points)

Emphasis: Keep running on backup systems

Strategy: Protect key rooms and pump out any water entering the rooms, whilst keeping support systems running. Subsequent clean up and dry out.

5.2.1 Receive notification of flood expectation

- Notify key staff
- Check with Environment Agency on expected extent of flood
- Brief Flood Management Team
- Check initial water level to establish a reference point for further rises
- Position staff externally to monitor flood progress (ensure radio contact).
- Check with energy supplier re: planned outages (time of and expected duration)

- Order diesel to fill tanks (if not at capacity)
- Arrange diesel re-supply as appropriate
- Check inventory of emergency equipment
- Deploy sandbags/boards around doors and walls of relevant rooms (See Appendix E).
- Position pumps in each of the above rooms (ensure that fuel tanks are full).
- Cut hoses to pump water seeping through sand bags back out of sandbag protected area.
- Notify Customer Support of situation
- Implement Customer Communication Plan (advisory briefing – loss of service possible)
- Brief Board on possible need to implement site shut down plan.

5.2.2 Appearance of water imminent

- Switch to Generator & shut down mains supply (check responsibility for isolating HV).
 - Outline procedure
 - Load transferred to generators

5.2.3 During flood

- Observe safety precautions (See Appendix D)
- Monitor water levels and other key reference points
- Keep monitoring all affected internal areas. Refer to markers on walls.
- Monitor water level in all plant rooms. Isolate and shut down all affected plant (eg isolate batteries and disconnect terminals)
- Start pumps when water depth in rooms is sufficient for pump operation.
- Reinforce flood defences as required.
- If water level rising too fast escalate to high impact response and implement site shutdown plan.

5.2.4 Post flood

- Maintain flood barriers until all water on car park surface has been removed (by pump or drainage)
- Remove sand bags/boards
- Position humidity sensors
- Deploy propane heaters until all areas are dry
- Clear debris
- Re-supply from another (nominated) site if local supply chains are disrupted.

5.3 High Impact (1,000 Yr. event):

Emphasis: Controlled shut down

Strategy: In this scenario, the level of flooding is so severe that there is no alternative but to plan for complete controlled shutdown. Protect plant as far as possible. Subsequent clean up and dry out.

5.3.1 Receive notification (estimated 5 to 8 hours)

- Notify key staff
- Get confirmation from relevant authority (Environment Agency/water company/local authority/emergency services) that site will flood / defences will be breached and site cannot be protected.
- Brief Flood Management Team
- Notify staff to move cars
- Check initial water level to establish a reference point for further rises
- Check with energy supplier for advice on power supply outages (time of & duration)
- Position staff externally to monitor flood progress (ensure radio contact)
- Order diesel to fill tanks
- Notify senior management / board (advise of requirement to implement Site Shut Down Plan)
- Check inventory of emergency equipment
- Check satellite phones are working
- Fit flood boards to relevant plant rooms.

- Apply silicone sealant around all door frames & fitted boards.
- Fit boards to generator grilles
- Notify customers of planned shutdown
- Implement Site Shut Down Plan

5.3.2 Implement Site Shut Down Plan

- Get approval for shutdown from relevant authority
- Relocate customer support to other sites to coordinate customer communication activity.
- Evacuate non-key staff
- Complete register of all personnel on site and notify personal contacts (family etc.)
- Evacuate visiting customers
- Maintain customer communications

5.3.3 Appearance of water imminent

- Implement shutdown – customer equipment
- Implement Site Shut Down
 - Procedure for plant shut down
 - Procedure for power shut down
 - Disconnect all battery terminals
 - Remove low lying batteries to higher shelves
 - Site off line
- Implement customer communication from other sites

5.3.4 During flood

- Observe safety precautions (see Appendix D)
- Monitor water level
- Keep staff on upper levels (do not use any lifts even if still operational)

5.3.5 Post flood clean up

- Position pumps and start pumping water out. Be aware of volume of water and time required.
Note: surface drainage is likely to become blocked and so will be inoperable.
- Maintain flood barriers (around doors etc.) until all external water has been removed (by pump or drainage)
- Remove sand bags/boards
- Position humidity sensors
- Deploy propane heaters until all areas are dry (monitor humidity sensors)
- Clear debris
- Evaluate extent of water ingress into plant rooms
- Evaluate damage to plant
- When deemed safe to do so, bring plant back on line and test
- Check with energy supplier on mains power status
- Run site on Generator (if available) until mains is restored
- Re-supply from another (nominated) site if local supply chains are disrupted.

6.0 Post event analysis

Ensure that a thorough review of the response is conducted as soon as possible after the event. It should assess physical aspects as well as procedures and management. It should include:

- Assessment of emergency response; what went well, what did not, areas for improvement, lessons learned.
- Staff debrief and feedback
- Customer debrief feedback
- Implement remedial actions: additional defences / equipment, changes in procedures or other measures that would improve future preparedness.

Appendix A

Evaluating flood risk for London Docklands

The primary flood risk for this area is tidal surge or a combination of tidal surge and high river levels. Previous incidents have involved a combination of equinoctial events plus very strong winds funnelling water into the Thames Estuary. The worst incident in living memory was in 1953.

A.1 Tide levels and surges

Tide levels are steadily increasing owing to a combination of factors. These include higher mean sea levels, greater storminess, increasing tidal amplitude, the tilting of the British Isles (with the south eastern corner tipping downwards) and the settlement of London on its bed of clay. As a result tide levels are rising in the Thames Estuary, relative to the land by about 6mm per year.

Surge tides are a particular threat and occur under certain meteorological conditions. When a trough of low pressure moves across the Atlantic towards the British Isles, the sea beneath it rises above the normal level thus creating a 'hump' of water, which moves eastwards with the depression. If the depression passes North of Scotland and veers Southwards in the North Sea, extremely dangerous conditions can be created.

A surge occurs when this mass of water coming from the deep part of the ocean reaches the shallow southern part of the North Sea. The height of the surge may be further increased by strong northerly winds. If a high surge coincides with a high 'spring' tide (spring tides occur twice a month) reaching the bottleneck of the Straights of Dover and entering the Thames Estuary, there could be a real flood danger along most of the tidal Thames. The overall rise in water levels steadily increases the possibility of flooding.

A.2 Public flood protection infrastructure

London's main flood defences include a number of moveable gate structures, by far the largest of which is the Thames Barrier. Together with the Barking Barrier and significant gates at the entrances to the old Royal Docks, the Thames Barrier is maintained and operated by the Environment Agency. The Thames Flood Barrier is designed to protect London from a scale of storm surge, the nature of which occurs with a frequency of 1 in every 1,000 years (up to 2030). i.e. there is a 0.1% probability of one of these occurring in any given year.

A.3 Monitoring conditions

Dangerous conditions can be forecast up to 36 hours in advance. The decision to close the barrier is taken by the Barrier Controller. This decision is based on the predicted height of the incoming tide as estimated by the Meteorological Office's Storm Tide Forecasting Service (STFS), together with information from the Barrier's own sophisticated computer analysis. The STFS monitors tides along the east coast and issues warnings of dangerously high waters. Their estimates are based on meteorological information from satellites, oil rigs in the North Sea and from land based meteorological stations. They also receive tide readings from recorders as far away as Stornoway in the Western Isles and Wick in the North of Scotland. The Barrier is usually closed between one and three hours after low water, some three to four hours before the peak of the incoming surge tide reaches the site. Tidal forecasts are prepared for the area using astronomical tidal predictions, fluvial flow forecasts, and weather data. Output from the Meteorological Office 36 hour weather model is received twice daily at the Thames Tidal Defences Control Room at the Thames Barrier approximately four hours after the model run. This is combined with fluvial flow forecasts and the predicted astronomical tides to give a 32 hour long tidal forecast which is updated every 12 hours. Actual tide levels at the Barrier are monitored 24 hours a day, 365 days a year.

A.4 Advance hazard warning

Should dangerous conditions be detected, warnings will be issued no later than two hours before the tide reaches the area; however it is expected that warnings will generally be issued about five hours in advance of a high tide. Flood warnings will be broadcast by regular media bulletins on local radio and television and will be issued directly from the Thames Tidal Defences Control Room at the Thames Barrier.

In addition to the public broadcasts, incident management staff can be nominated to receive warnings by SMS/automatic voice messaging.

The conditions building up to the occurrence of a 1 in 1,000 year event would take some time to accumulate and would be evident some time before becoming an immediate threat to London and the Thames estuary. To put this in perspective, the event that occurred in 1953 causing 300 deaths and widespread flooding down the east coast of England was a 1 in 300 year event. Given that a 1 in 1,000 year event would broadly follow the same path, leaving a trail of destruction down the east coast, it would obviously be receiving a great deal of news coverage en route.

A.5 Times of increased risk

As a general rule, the level of risk is at its highest during the 'Flood Season', which runs from September to the end of April each year. This is due to higher rain fall giving rise to greater fluvial flow during this period. Decisions to close the barrier during high fluvial flow are more complex with more factors to balance, as closing the barrier increases the risk of flooding through the 'Upstream Section' (Putney Bridge to Teddington Weir).

A.6 Local area flooding scenarios

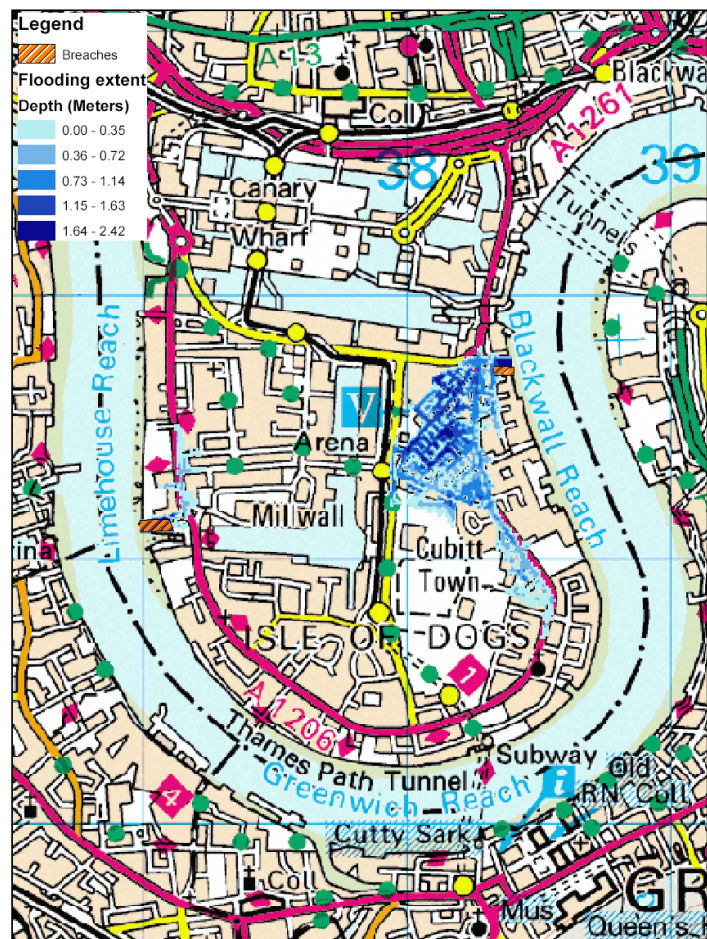
Although the Thames Barrier and its associated defences will protect the Docklands area from storm surges of up to the 1 in 1,000 year events (up to 2030), there are other potential flood scenarios that could arise with little or no warning. For instance, the Barrier Controller may allow a very high tide past the barrier (not quite high enough to trigger closure) and a key piece of flood defence may subsequently fail. Although the effects of this failure would be localised flooding, if it occurred at the point of high tide, then the flood would be impossible to stop and would give no warning. Such a scenario could arise through either an accidental failure, or as the result of deliberate damage. The likelihood and impact of such an event is increased during the flood season.

In order to establish vulnerability to such an event, the following analysis was carried out by the Thames Barrier Flood Incident Management Team, using 'THEMIS', their bespoke Hydrological Modelling software. This provides a visual of a potential flood impact on the Isle of Dogs should such a scenario occur. The scenario involves using a failure of the river defences on both the east and west side of the island simultaneously and is based on the following assumptions:

- The tide is the largest that would be allowed through without triggering a closure.
- The simulated breaches are very large (approx. 80 metres).
- Based on this analysis, this is an extreme scenario and very unlikely.

A.7 Expected depth of flood water

The Barrier Controller's official approach is not to speculate on absolute water levels in the event of a major flood (1 in 1,000 yr. event), as in their view these levels will constantly change and would be impossible to predict or model. However they do suggest that in during major events, water levels of 1.5m higher than existing dock water levels are possible, but levels of 3.0m are almost certainly not possible. Therefore maximum flood levels envisaged are +3m.



Appendix B

Schedule of equipment & supplies

Equipment required:

- 2-way radios (+ spare batteries)
- Absorbent granules (tonnes, palletised if need be)
- Battery powered radio for news updates
- Blankets
- Buoyancy aids (life jackets)
- Cleaning equipment
- Climbing rope/s / harnesses
- Digital camera – collection of evidence for insurance purposes
- Drinking water (3 day supply)
- Dry suits
- Extension cables
- First aid supplies
- Flood lights
- Food rations (3 day supply)
- Gas/paraffin lanterns/candles
- Gas/paraffin stoves/cooking equipment
- Heavy duty bin bags
- High visibility jackets
- Hoses for pumps (length specified) + spare section for cutting to size
- Humidity meters
- Inflatable boat + oars
- Large supply of silicone sealant
- Masonry drill bits, screws & plugs
- Mops/buckets/shovels/hand bailers (plastic dustpans can substitute)
- Overalls
- Pallet truck
- Petrol driven water pumps (specify capacity based on potential volume of water)
- Plywood boards cut to size for fitting over vents etc.
- Portable petrol driven generator
- Power drill/s
- Power screwdriver/s
- Propane heaters (not to be used until all standing water has been removed).
- Protective goggles/face masks
- Rolls of polythene sheeting/duct tape
- Sand bags (palletised 1 tonne per pallet (in 1 tonne bags)
- Sanitation supplies
- Satellite phones (+ spare batteries)
- Sleeping bags
- Spare warm clothing
- Steel shelves/racking to stow low lying batteries
- Supply for fuel for above (n * x Lts barrels + hand pump + small petrol containers)
- Supply of gas for propane heaters
- Torches (+ spare batteries)
- Vermin control (rat poison/air gun)
- Waste bins
- Waterproof gloves
- Wellington boots (assorted sizes)

Appendix C

Impact of potential water damage on plant

The following is a brief summary of the potential impact of water damage to plant and equipment that is likely to be affected during a flood:-

Batteries: Batteries submerged in water will short circuit across the terminals. This not only discharges the batteries, but causes corrosion of the terminals themselves. There is some risk of water getting into the cells through the vents, causing the electrolyte to become diluted and contaminated. Batteries will normally be perfectly resilient to being dropped briefly into a water bath; however prolonged exposure would generally result in the batteries becoming damaged beyond repair.

The main risk in entering a flooded UPS area is standing in the water and touching a live electrical termination, so the area should be isolated and drained as quickly as possible. Disconnection of battery terminals prior to submersion is recommended.

Cast resin transformers: If transformers are subject to total immersion in water there is a risk of the insulation breaking down causing water ingress in to LV windings. However, the Transformers should be able to withstand immersion in water up to a depth of x mm from mounting without sustaining damage.

Cabling: When any cable product is exposed to water, any metallic component (such as the conductor, metallic shield, or armour) is subject to corrosion that can damage the component itself and/or cause termination failures. If water remains in medium voltage cable, it could accelerate insulation deterioration, causing premature failure. Cable that is listed for use in only dry locations may become a shock hazard, when energised, after being exposed to water.

Electrical distribution equipment: Electrical distribution equipment usually involves switches and low voltage protective components such as MCCBs and fuses within assemblies such as panels and switchboards. The ability of the protective components to protect circuits is adversely affected by exposure to water and to the minerals and particles which may be present in the water. In MCCBs and switches, such exposure can affect the overall operation of the mechanism through corrosion, through the presence of foreign particles and through the removal of lubricants. The condition of the contacts can be affected and the dielectric insulation capabilities of the internal materials can be reduced. Some MCCBs are equipped with electronic trip units and the functioning of these trip units might be impaired. For fuses, the water may affect the filler material. A damaged filler material will degrade the insulation and interruption capabilities of the fuse.

Lighting fixtures and ballasts: Flooded lighting fixtures and associated equipment, may be damaged by corrosive materials, sediment and other debris in the water. Corrosion of metallic parts and contamination of internal circuitry may prevent the equipment from operating properly. Lighting fixtures and associated equipment known to have been submerged should be replaced.

Motors: Motors which have been flooded by water may be subjected to damage by debris or pollutants. This may result in damage to insulation, switches, contacts of switches, capacitors, overload protectors, corrosion of metallic parts and contamination of the lubricating means and should be evaluated by qualified specialist personnel.

Fuel: Check for water contamination.

Appendix D

Health and safety considerations

As general guidance that should be communicated to staff, the following points should be borne in mind when dealing with a flood:

- Floods can kill. Avoid walking through flood water – six inches of fast flowing water can knock you off your feet. Manhole covers may have come off and there may be other hazards that you cannot see.
- Never try to swim through fast flowing water – you may be swept away, or be struck by an object in the water.
- Always move slowly and carefully. Standing water and mud can obscure holes and sharp objects such as broken glass. Sediment can also be slippery.
- Wear protective clothes, sturdy boots, waterproof gloves and face masks when handling debris.
- Flood water may be contaminated by sewage, chemicals, or rat's urine (leading to Weil's disease). Keep your hands away from your face while cleaning and always wash your hands if you make direct contact with flood water or silt.
- Wash cuts and grazes and cover with a waterproof plaster. Get a tetanus jab if you are not already inoculated.
- Do not attempt to move heavy objects that may be unstable and could suddenly shift and trap or crush you.
- Do not use lifts even if still operational and backed up by generator.
- Evacuate all enclosed spaces when water level is rising.

Appendix E to Annexe III

Protective measures

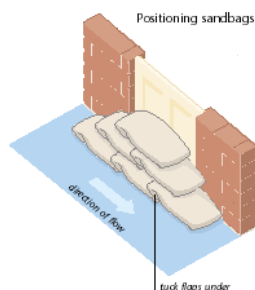
Preparation & deployment of sandbags

Sandbags are one of the most well-known devices for keeping floodwater out of your property. Unfilled sandbags and a supply of sand can be purchased from some DIY stores and Builders Merchants, but remember that if there is a flood in your area demand may exceed supply as people rush to buy them. Some local authorities may provide sandbags in an emergency, but again there may be limits to availability.

If you have not purchased sandbags and sand in advance, you can use alternatives such as pillow cases or refuse sacks and fill them with garden soil. Remember that they can get heavy quickly, so do not overfill, or fill them too far away from where you want to position them.

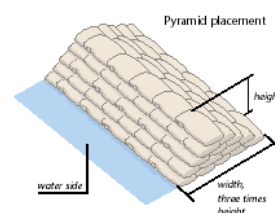
How to Fill and Position Sandbags

- Unless you have access to a sandbag filling machine, this is a two person job: one to hold the bag open and one to fill.
- Sand is abrasive – both people should wear protective gloves.
- Do not fill bags more than half full.
- It is not necessary to tie the end of the bag.
- Remove any debris from the area where the bags are to be placed.
- Place the half filled bags lengthways and parallel to the direction of the water flow. Tuck the opened end under the filled half of the bag and position it pointing into the water flow.
- Place bags in layers. Like a brick wall, make sure that in the next layer each bag overlaps the one below by half.
- Stamp bags firmly into place to eliminate gaps and create a tight seal.



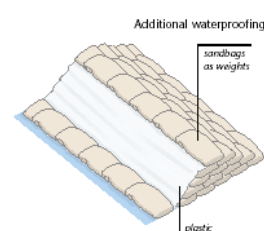
Pyramid Placement Method

If you need to create sandbag protection that is more than three layers high you will need to build in a pyramid style. For the structure to be stable, you should build the 'sandbag wall' three times as wide as you need it to be high. It will also be more effective if you alternate the layers lengthways and crosswise. Stamp each bag in place and tuck the loose end firmly under the filled portion of the bag.



Additional Waterproofing

Lay plastic sheeting across the side of the 'sandbag wall' that will face the floodwater. Weigh down with additional sandbags.



Remember!

Sandbags are popular but they have disadvantages:

- During an emergency sufficient quantities may be difficult to obtain
- They are time-consuming and require two people to fill
- They can be difficult to handle, particularly for the elderly or infirm
- When they come into contact with floodwater they tend to retain contaminants such as sewage
- Sacking material is biodegradable, and will disintegrate if left in place for long periods of time

Flood boards can avoid some of these drawbacks

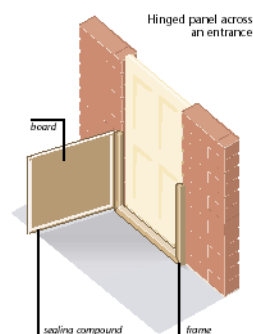
Preparation & deployment of flood boards & other methods

How to Make and Use Flood Boards

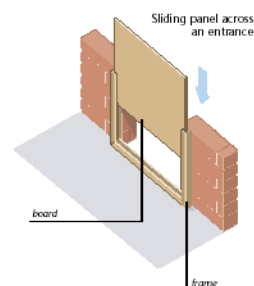
The most basic method is to construct a strong wooden or metal barrier that is secured flat against the wall or frame surrounding a door or window. The pressure of floodwater itself will help seal the barrier. This can be enhanced by adding suitable material to make a seal between the wall and the board, for example a blanket or silicone type sealing compound.

The efficiency of makeshift flood boards will depend on the strength of the walls and the durability of the fixings used to secure the wooden or metal panels.

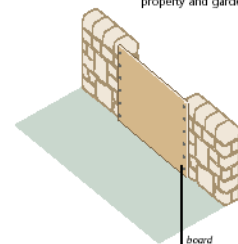
Purpose-made flood boards for doors, windows and air bricks will be more successful than sandbags for minimising floodwater entering a property. They are available commercially, but can be easily made by someone with DIY knowledge. In either case the product or materials will need to be purchased and installed in advance of a flood.



Most commonly, this type of flood board will comprise a frame and board or panel. Retaining fixtures may need to be a permanent feature of the property, but the frame and gate can be removed and stored when not in use. If a flood is imminent, most can be installed in a matter of minutes.

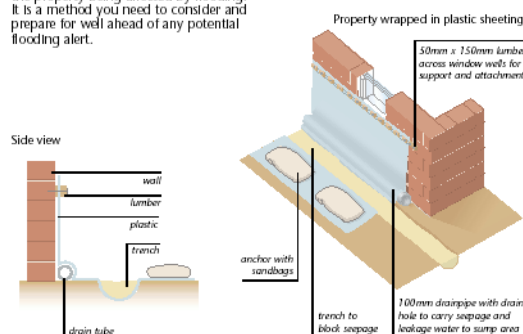


Using boards to prevent floodwater entry to property and gardens



This is an advanced method of reducing the effects of floodwater by enclosing the bottom 600-900mm of a property in plastic sheeting.

The process requires some DIY ability, plenty of suitable materials and enough time to construct the wrapping prior to the property being affected by flooding. It is a method you need to consider and prepare for well ahead of any potential flooding alert.



Hazard!

Do remember that in cases of very severe flooding (where the floodwater is more than one metre deep) keeping water out of your property can do more harm than good. Unless your building is specifically designed to withstand such stresses, the hydrostatic pressures involved with deep water can cause long-term structural damage and undermine the foundations of a property. Therefore you should not aim to prevent water from entering your property through any windows, doors, airbricks etc. more than one metre above the level of the ground surrounding the property.

Also consider the type of soil on which your property is built. If it is porous (eg chalk) and a water table lies immediately below the ground, it is very likely that in times of flooding water will rise up directly into your property through the ground floor. In these circumstances it is better to spend your time removing possessions to a safe place, rather than wrapping your home.