ZURICH

Flood Emergency Plan

Actionable advice

Natural Hazards Resilience
Prepare, Respond, Survive, Recover

An Emergency Response Plan (ERP) is an important tool to help reduce the impact of damage of a natural hazard to your property, business and employees.

This Flood Emergency Response Plan details some actions to consider if your location is exposed to a flood hazard, either from intense rain or a water body.

Preparation Phase

Response Phase

Recovery Phase

Note: the sources of flooding indicated in this document include groundwater (designated as Ground), surface water; either river, stream, sea or lake (designated Surface) or rain including wind-induced damage to roofing (designated as Rain). ALL indicates actions to be implemented for all sources of flooding.

An effective Flood Emergency Plan,

when properly executed, can greatly reduce potential property damage and business interruption. Most flooding events allow an adequate warning period to implement an effective emergency response plan. This warning period is an important factor to consider in the development of the plan.

Once the response plan is developed, train all involved staff, practice the plan, and learn from the things that work well and from those that do not. Outside emergency response services should be involved in the planning and training. Effectiveness of the plan is contingent upon support from upper management.

The following table provides advice for preparation of a response plan depending on the stage of flooding.

Preparation Phase

The activities during this stage are primarily of a planning nature and should be part of a comprehensive risk assessment analysis.

The time frame for these activities is typically several months before a potential event.

Action	Detail			Flood source
Identify flood sources: rivers, streams, lakes, rain, reservoirs, dams etc.	• Clarify with local authorities (see below).	• For locations with high value and/or significant contribution to the business or supply chain, conduct a site specific flood analysis. Include even small streams and topographic features, e.g. A site in a low-lying area is at risk of flooding.		All
Identify and contact authorities and agencies responsible for monitoring of water-level or rain intensity (forecasting and monitoring service).	• Identify local authorities responsible for this service and include the site management/emergency response team in any notification and warning service issued by this authority or agency.	• Define the time between the various warning levels and time required for the event to reach the site for each individual water source.		All
Determine the lead time available to implement the flood plan.	• Identify the local authority or agency responsible for monitoring meteorological and water body conditions.	• Establish the conditions (water levels or rain intensities) at which warnings are issued by the relevant authorities and the time/distance until adverse conditions reach the site.	• Define actions for each warning level and the team responsible for implementing these actions, as well as resources required, for each individual water source.	All

Preparation Phase

Action	Detail			Flood source
Define emergency response organization.	• Ensure a sufficient number of trained personnel and proper resources will be available before, during and after the flood event, to implement the plan. Factor in the potential for appointed persons being absent from work. • Ensure members of the organization have authority to implement the requisite response actions. • This includes not only trained staff, but also any auxiliary equipment, spare parts.	• Conduct regular testing of pumps or other equipment, e.g. emergency lighting, backup power supply. • Ensure adequate fuel is available for emergency equipment. Store fuel safely according to fire safety requirements and ensure it will not be impacted by flood water.	• Communication protocols should be established. Consider issues such as loss of cell phone battery power without mains power to recharge or cell phone network outages. So consider alternative means of communication such as the posting information on an internet page, sending emails for mass communication or issuing satellite phones for use between key personnel, etc.	All
Identify and contact authorities and agencies responsible for monitoring of water-level or rain intensity (forecasting and monitoring service).	• Water-sensitive content and some parts of production can be relocated to alternative levels or facilities.			All
Determine the lead time available to implement the flood plan.	• Important digital documents and data should be backed up regularly to a data center or storage area which is located offsite and not considered to be at risk from the same flood event.	• Critical paper documents should be stored away from basement and ground floor levels in flood prone areas.		All

Preparation Phase

Action	Detail			Flood source
Identify equipment, stock and material, which could potentially be affected by roof damage-induced flooding.	• Flooding of the building due to roof damage is common not only due to high intensity rain but to wind events as well. Rain infiltrates through the roof into the building, resulting in damaged equipment and stock, predominately in the upper levels of the building.	• Ensure a regular inspection and maintenance plan is implemented for building envelopes (wall panels, roofing systems, drainage systems, doors, windows), especially for production-critical buildings or those with high-value content.		Rain
Identify below-ground structures potentially exposed to flood waters.	• Identify flood protection measures for these critical areas. • Move high-value or production-critical equipment to higher levels.	• Identify what materials and portable equipment must be relocated from flood exposed areas before flood waters enter the site.	• Define septic tanks, sewage lines, etc. through which flood water can backflow into the buildings or site and provide backflow prevention valves, where necessary.	Surface and Ground
Identify what flood-exposed equipment and structures must be anchored to secure foundations.	• Uplift (buoyancy) of equipment, tanks, machinery, etc. due to flood can be avoided by pre-event identification of such components. As an example, day tanks for emergency power generators and firefighting pumps, storage tanks, etc.	• Besides anchorage, top-up of these elements can also be implemented to prevent flood-induced buoyancy.		Surface and Ground
Inspect roof panels, gutters, water proofing systems, roof-mounted equipment anchorages, conditions of eaves, etc. as part of the building's regular maintenance plan.	• Architectural and topographic features can result in high variations in wind forces on different parts of the building. Identify these critical areas with the support of a qualified structural engineer.	• Wind can tear off roof panels and expose of building contents to rain damage. Regular maintenance reduces likelihood of damage.	• Conduct a detailed structural analysis of wind resistance, especially for older buildings. It should be conducted by a qualified structural engineer in accordance with pertinent wind design codes.	Rain

Preparation Phase

Action	Detail		Flood source
Regularly check all equipment, including fuel pumps, emergency power generators, etc. as part of the building's regular maintenance plan.	• Prepare a formal building maintenance plan, where types, frequency, responsibilities, etc. of activities are clearly defined. Results of inspections are to be documented.		All
Inspect roof and site drainage systems as part of the building's regular maintenance plan.	• Ensure building contents are protected when conducting any activities, such as pressure testing of drainage pipes.	• Issues to consider are not only removal of debris, but also pressure testing of drainage pipes etc.	Rain
Verify all installed back-flow valves and closures are fully functional.	• This is to be included in the building's regular maintenance plan.		All
Conduct regular training exercises. Include the participation of local emergency services.	• Document all lessons-learned and define and implement areas of improvement.		All
Include details of utility suppliers (gas, power, water etc.) into flood plan.	• Continued supply of utilities is necessary for post-event site rehabilitation and resumption of activities.	• Contact utility suppliers and become familiar with their response plans, including definitions of the critical flood levels and corresponding actions.	All

Preparation Phase

Action	Detail			Flood source
Include details of various contractors into flood plan.	• The list may include: sprinkler system contractor, power transformer contractor, heat exchange room contractor, plumbers, decorators etc.	• This is necessary also for post-event rehabilitation of the site.		All
Prepare diagrams/plans showing locations of shut-off valves.	• Identify locations of backflow valves, power, gas, water valves and other utilities.	• Define responsibilities and action levels for each stage of the event with regards to shut-down levels of the plant.		All
Prepare diagrams/plans to indicate the locations for flood measures (e.g. mobile flood protection, tie-down of equipment).	• Define responsibilities and action levels for each stage of the event with regards to mobilization of the protection system measures and where these are to be implemented throughout the site.			Surface and Ground
Ensure that roof and site drainage systems have been designed according to local design codes.	• Local rainfall intensity-duration-frequency parameters are to be used in the design.	• This item is recommended if any expansion of an existing site (especially older ones) is planned. Note that **code-defined** rainfall characteristics, drainage system requirements, safety factors, etc. have potentially changed since.	site inception. It is also highly likely that drainage is not an 'engineered' system, i.e. has not been designed to a code nor local rainfall intensities considered, but rather merely been procured off-the-shelf. This activity is to be conducted by a qualified specialist.	Rain
Sign contracts with subcontractors for post-event recovery work.	• These are companies, who support the site in post-event debris removal, repair of damaged infrastructure, etc.			All

Preparation Phase

Action	Detail			Flood source
Prepare hand tools and personal protective equipment.	• Equipment for small repairs (e.g. shovels, mattock, submersible pumps) should be stored in an accessible place. Pumps and other mechanical items should be checked and tested, and the results of these should be documented.	• Pre-purchase blowers and dehumidifiers in order to facilitate the drying out process of building and assets. These items will be in high demand post-event.		All
Identify needed sewer lines backflow protection, e.g. at exit points of black, i.e. industrial, water or sewage water pipeline, septic tanks, etc.	• Use drainage drawings and design documentation to determine locations of septic tanks, outlets, etc.			All
Identify construction material that could potentially be damaged by flood water, e.g. facade elements of composite panels, and prepare a stock of replacement material.	• Scarcity of construction materials is common after any natural hazard event. Providing a stock of replacement material, as well as onsite expertise to conduct necessary repairs, ensures quick restoration of operations after the flood event.	• Consider replacement of water-sensitive construction materials, e.g. replace composite panels for façade elements with precast concrete at critical buildings.		All
Prepare employee safety measures for potentially delayed evacuation if your location is at risk of flash flood, rapidly rising river flood, riverbank failure, etc.	• Due to the short warning time of such events, a timely evacuation of staff may not be possible.	• Prepare stocks of fresh water, non-perishable and canned goods.	• Provide communication equipment (2-way radios), as well as spare batteries.	Rain

Response Phase

Once the flood trigger levels and corresponding time-frame for each level have been identified, the corresponding actions and resources at each level can be defined.

Activate the contingency/ emergency response plan in the predefined sequence according to the defined hazard (trigger)/action levels. Example actions are provided below (list is not conclusive and not in sequence).

Action	Detail
Maintain a detailed log of events (diary or log book).	• Detailed documentation of the event, e.g. maintaining a log book documenting alarm stages, internal communications and actions, photos of measures taken onsite and of the event before, upon and after arrival onsite, etc. will not only facilitate the post-event loss adjustment exercise but also support the emergency response team and site management in improving the response plan.
Keep stakeholders informed of situation.	• Not only suppliers and customers, but also staff should be informed of developments. • Inform tenants/suppliers to stop goods delivery. • Communication function, to both employees as well as to local authorities, media, etc. should be .
Prepare for safe shut-down of operations.	• Critical operations and utilities are to be identified as part of the risk assessment conducted during the preparation stage.
Remove all hazardous substances to a safe location.	• These locations, as well as access routes, based on flood levels are to be defined during the preparation stage.
Remove portable machinery and equipment to higher levels (groundwater/river flood) or away from the building envelope (wind/rain).	• These locations, as well as access routes, based on flood levels are to be defined during the preparation stage.

Response Phase

Action	Detail
Remove stocks to higher levels or away from building envelope.	• These locations, as well as access routes, based on flood levels are to be defined during the preparation stage.
Close sewer backflow prevention valves and plug drains and/or sewer lines to prevent sewage backup.	
Check and plug toilets (basement toilets in potential flooding areas should be removed and the drain pipe should be plugged).	
Isolate any low level electrical equipment, shut down machinery & equipment.	• Equipment which is not portable and cannot be removed must be protected from flood effects.
Contact storage facility for mobile flood protection systems (if applicable).	
Secure all buildings.	

Recovery Phase

The following are some of the suggested actions to be undertaken once the pertinent authorities have declared conclusion of the flood event and the site may be safely accessed.

Action	Detail
Assess and document damages.	• Document (with photos) extent of damage. This will facilitate the claims process.
Contact staff and inform of situation.	• Communication function, to employees, clients, suppliers, as well as to local authorities, media, etc. should be defined within the emergency response team.
Initiate clean-up operations when safe to do so.	• Site access only after instructions from pertinent authorities. • Remove ruined, moisture-soaked objects from the affected buildings and away from the walls to facilitate the drying out process. Damaged material, which is also most likely to be contaminated, is to be disposed according to local regulations.
Have all utilities checked by qualified personnel before use.	• Power and other utilities to be restored only after inspection by qualified personnel to ensure employee safety upon resumption of operations and prevent equipment damage.
Inform insurance.	• Provide photo documentation of damages as well as diary of events (log book).
Conduct environmental controls.	• If water has been collected in retention pits test surface water collected therein for potential contaminants.

Recovery Phase

Action	Detail
Inform disaster recovery company, if one has been contacted for such services.	
Inform public sanitation of site damage.	
Inform electricity and gas supply company to restore services.	

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