

Use of Temporary Flood Barriers



PROCEDURAL

GUIDELINE

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Review period

This position should be reviewed by the doctrine owner come 1 September, 2021.

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Acknowledgements

This guideline has been developed from the work of attendees at a forum on temporary flood barriers held jointly by the Attorney-General's Department and AFAC in June, 2012. The contributions of the Attorney-General's Department and the attendees of that forum are gratefully acknowledged.

Source of authority

AFAC Council endorsed the *Use of Temporary Flood Barriers* guideline on 18 April 2013.

Purpose

This guideline defines operational and safety considerations for the use of temporary flood barriers. It should be used in conjunction with agency specific operational doctrine and procedures.

Scope

This guideline focuses specifically on the use of purpose-made temporary flood barriers. It does not include considerations for urban barriers, alternative barriers and barriers that are not designed to withstand flood water, such as concrete barriers.

Statement of engagement

This guideline was originally authored by Paul Considine, Manager NRSC. It was further reviewed by AFAC's SES Operations Group on 29 June, 2016, and updated accordingly on 9 August, 2016.

Audience

This guideline is intended for use by AFAC members, notably Australian and New Zealand emergency service agencies and operational personnel.

Definitions, acronyms and key terms

In this guideline, the following terms have specific meanings.

Backwater: an inundated area that is not subject to flow paths and where water velocity is minimal.

Design height: the height of floodwater that a permanent or temporary structure is designed to retain without failure. A design height is usually identified with the assistance of engineering advice, and will generally be lower than the physical height of the structure.

Flow path: areas of the floodplain where significant discharge or storage of water occurs during a defined flood event. Flow paths are areas that, when filled or even partially blocked, cause a significant redistribution of flood flow or significant increase in flood levels. Flow paths are aligned with naturally defined channels and are often, but not necessarily, areas of deeper flow or areas where higher velocities occur. This also includes areas where major storage of flood waters occurs. Each defined flood event has flow paths, and the extent and behaviour of flow paths may change with flood severity¹.

Levee: a permanent structure designed to prevent inundation of an area behind it.

Overtopping: the process of floodwater rising to the same height, or higher, as a levee designed to retain it, and hence flowing over the top of the levee.

Risk assessment: a process of risk identification, risk analysis and risk evaluation consistent with the principles in AS/NZS ISO 31000:2009 *Risk Management – Principles and Guidelines*.

Temporary flood barrier: a temporary structure designed to withhold or divert flood water. These are completely removable from a location and are distinct from demountable flood barriers (requiring installation of some permanent components in the location that it is to be used).

¹ Definition taken from that of 'defined floodway', Australian Emergency Manuals Series, Manual 19 *Managing the Floodplain*, Commonwealth Attorney-General's Department, 1999.

Introduction

AFAC guidelines are a preferred or advisable reference in a course of action. Member agencies are expected to be aware of guidelines, and to have considered how best they apply to relevant circumstances faced by the agency. Guidelines are addressed to AFAC member agencies, and agency personnel should refer to their agency operating procedures for further information.

This Guideline is to assist and support agencies contemplating the acquisition or use of temporary flood barrier systems. It reflects a consensus on good practice at the date of publication.

AFAC's guideline

Background

There are a number of commercially available temporary flood barrier products. They fall into three broad categories:

The angle wall type (generally folds flat for storage):



Photo: Bob Embleton

The water inflatable or self-inflatable type:



Photo: Bri Weldon

The large filled containers / sandbag structures:



Photo: US Army

Each type of system meets a certain demand for flood protection, and may be suitable across a range of conditions, subject to the particular circumstances of a location. There is no Australian / New Zealand standard for temporary flood barrier systems. The suitability of a given type of system requires assessment in the context of the specific conditions it is intended to deploy it in.

Guidance

The purpose of temporary flood barriers is to protect assets and evacuation routes from flood inundation. The use of temporary flood barriers takes place in the context of whole-of-floodplain management, including:

- land use planning,
- community planning and preparedness,
- risk reduction, and
- emergency response.

The upstream / downstream consequences on flood behaviour by erecting temporary barriers are the same as those from erecting a permanent levee structure of the same size in the same location. Therefore, the considerations that must be taken into account when deploying temporary systems are similar to those involved in the design and erection of permanent structures.

Any deployment of temporary flood barrier requires a risk assessment and may, depending on scale, require engineering advice about the foundations the temporary system will be deployed on and the resulting upstream / downstream effects.

The following considerations should be taken into account when making decisions about the acquisition and deployment of temporary flood barrier systems.

- The opportunity costs of acquiring and deploying systems need to be considered against competing priorities.
- Human resources are required to transport, deploy and monitor deployed temporary barriers, and these must be accounted for just as the costs of acquisition, maintenance and storage are.
- Temporary barriers are not a viable solution to ensure comprehensive community protection in large scale flood events where hundreds of kilometres could be required.
- Temporary barrier systems may be tens or hundreds of metres long, compared to sandbags that typically protect single properties or important structures. Consideration must be given to ensuring that, when large sections of barriers are deployed, they do not cause adverse effects on other areas (by blocking important flow paths for instance).

Temporary barriers carry increased risk factors over permanent barriers, including:

- workplace health and safety aspects of erecting, maintaining and dismantling them;
- failure of supporting ground (seepage under the barrier and under any supporting hard surface, e.g. bitumen);
- design height limitations of temporary systems (unless they are part of a permanent flood mitigation scheme, the fixed height of the barrier relative to the height of the flood in the area it is being deployed to must be understood and planned for);
- potential inability or failure to erect in advance of an encroaching flood (time and logistics relating to deployment of cached systems, including access to flood prone areas or egress from the storage location if this is flood affected);
- potential to not withstand overtopping, e.g. inflatable systems may float or roll away; and
- potential to be punctured or damaged by flood debris, or have foundation seepage issues.

Owing to the aforementioned considerations, permanent flood mitigation systems should be used in preference to temporary systems if acceptable and practicable. Technical, economic, environmental and social ramifications must be considered.

It is never appropriate to erect a temporary flood barrier on top of an existing levee unless the existing levee has been specifically designed for this purpose or is certified to be able to withstand the increased load that an additional barrier imposes. Inflatable temporary barriers should not be deployed on top of existing levees because of the danger of them rolling off.

Deployment considerations

Use of temporary barriers could be considered:

- where there is a gap in a permanent levee and appropriate engineering advice has been sought, preferably by design and planned for as part of a flood mitigation scheme;
- where a permanent levee has been planned but not yet constructed / completed;
- in a backwater area where engineering advice states that use of a temporary barrier should not have adverse effects; or
- for localised emergency key infrastructure protection.

Where temporary flood barrier systems are deployed to protect key infrastructure, this should be planned in advance of any emergency incident. Infrastructure owners should assess their own flood risk and make decisions about managing it. Consideration should be given within the jurisdictional emergency management context as to who should bear the cost of acquisition and deployment of temporary flood barrier systems to protect key infrastructure.

Where private individuals or entities plan to deploy temporary flood barrier systems to protect their own property (commercial or domestic), owners should:

- assume responsibility for purchasing and deploying the system;
- comply with any development controls or planning permit requirements and legislation; and
- deploy so as to not obstruct flow paths or create worse flood impacts on adjoining land.

Where temporary flood barrier systems are deployed as part of a flood mitigation scheme which includes permanent levees, owners should:

- plan for the emergency management scheme should and make provisions for deployment;
- consider the design height, design standards (including how it is keyed in to adjacent levees and other structures), storage, resources required for set up, workplace health and safety requirements and maintenance needs;
- require barrier manufacturers to certify maximum flood height that the barrier has been designed for; and
- clarify design height and performance aspects in the flood mitigation scheme.

Where temporary flood barrier systems are deployed by emergency service agencies, owners should consider:

- any design or operational limitations of the structure (e.g. the height of floodwaters above the bottom of the barrier above which there is a danger of failure, and what resources will be required to deploy; and the foundation conditions);
- where the barriers will be stored and where they could be deployed;
- training requirements;
- require the manufacturers to certify maximum height of flood that the barrier has been designed for; and
- maintenance requirements and any potential liability issues.

Safety

Before allowing people to remain in place behind temporary flood barrier systems, a risk assessment should be carried out. It should take account of the likelihood of a structural failure in regard to predicted flood height. Considering the likelihood of exceeding the safe height permitted by the barrier is mandatory, as is knowing the stability and resistance to failure of foundations or adjoining permanent levees where relevant. Knowing the potential for flood debris to affect the barriers is also critical. The consequences of failure – even if the likelihood of a failure is ‘very unlikely’ – are necessary to treat as potential risks with significant affects. If the likelihood of failure or the consequences

of failure cannot be determined with a high degree of confidence, then evacuation should be considered.

Liability

Agencies considering the acquisition and use of temporary flood barriers should educate themselves on any potential liability for personal or property damage caused if a failure occurred. They should also ensure that clear channels of authority exist under legislation to construct the barriers.

Supporting discussion

Outcomes of the AFAC and Attorney-General’s Department temporary flood barrier forum held 27-28 June, 2012.

Definition taken from that of ‘defined floodway’, Australian Emergency Manuals Series, Manual 19 *Managing the Floodplain*, Commonwealth Attorney-General’s Department, 1999.

