

Engineering a Better Solution

Officine Maccaferri S.p.A.
Via J.F. Kennedy, 10
40069 Zola Predosa (Bologna) - Italy
T: +(39) 051 643 6000
F: +(39) 051 643 6201
E: info@hq.maccaferri.com
www.maccaferri.com

Maccaferri's motto is 'Engineering a Better Solution'; We do not merely supply products, but work in partnership with our clients, offering technical expertise to deliver versatile, cost effective and environmentally sound solutions. We aim to build mutually beneficial relationships with clients through the quality of our service and solutions.

GLOBAL ENGINEERS

In the second half of the 19th century, we invented Gabions and dramatically changed the civil engineering landscape. We are still changing today. We work every day to find better solutions for our clients at every degree of latitude and longitude. Our worldwide network grows through innovation and diversification of sectors of activity and through an increasing range of high quality and environmentally friendly products and applications.

OFFICINE MACCAFERRI GROUP PROFILE

Founded in 1879, our Group soon became a worldwide reference in the design and development of advanced solutions, with offices in over 70 countries and 30 factories worldwide.

Our mission is to pursue excellence through continuous improvement, while delivering to customers engineered solutions that are innovative, advanced and environmentally friendly. We are committed to outstanding safety, quality and sustainability, to create value for all stakeholders as well as our communities.

MACCAFERRI APPLICATIONS

- | | | | |
|--|---|--|---|
|  RETAINING WALLS & SOIL REINFORCEMENT |  SOIL STABILISATION & PAVEMENTS |  DRAINAGE OF STRUCTURES |  FENCING & WIRE |
|  HYDRAULIC WORKS |  BASAL REINFORCEMENT |  TUNNELLING |  AQUACULTURE NETS/CAGES |
|  ROCKFALL PROTECTION & SNOW BARRIERS |  COASTAL PROTECTION, MARINE STRUCTURES & PIPELINE PROTECTION |  LANDSCAPE & ARCHITECTURE |  CONCRETE FLOORING, PRECAST & OTHER USES |
|  EROSION CONTROL |  ENVIRONMENT, DEWATERING & LANDFILLS |  SAFETY & NOISE BARRIERS |  INDUSTRIAL MANUFACTURING |



FLOOD & EMERGENCY WORKS

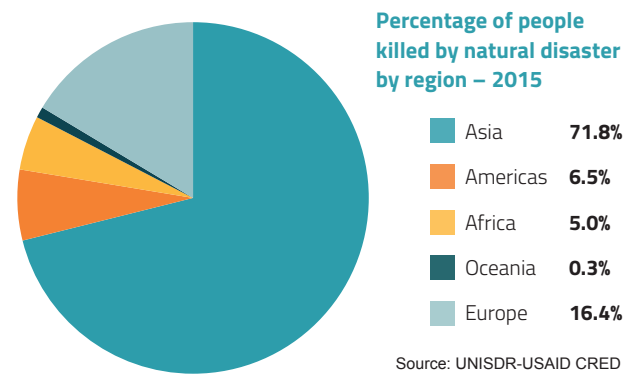
INTRODUCTION FLOOD & EMERGENCY WORKS

It is argued that global warming over the last century has affected the frequency and the scale of natural disasters. This climate change has impacted sea levels which have been rising about 3mm per year since 1993 and a total increase of 200mm in the global average sea level since 1870.



In recent years, floods, landslides, tsunamis and coastal erosion are becoming more frequent and with greater intensity. Furthermore, there is a close interaction between these different natural disasters so that they tend to occur together or one can trigger another, increasing the potential damage and loss.

These disasters not only affect people and communities but also economies, governments and the international systems on which we all rely. Any response to floods and emergencies must be rapid and effective in order to restore the natural status of the impacted region, to contain the damage and lives can be restarted.



- There were an average of 173 million people per year affected by natural disasters from 2005 to 2014
- In the last 10 years, natural disasters have caused an average of \$180 Billion in damages each year.
- Asia is the most affected continent. In 2015 six out of ten deadliest disasters occurred in the continent.

Natural disaster occurrence by disaster type

Natural disaster	Average 2005-2014	2015
Flood	171	152
Storm	99	90
Drought	15	32
Landslide	17	20
Earthquake & Tsunami	25	19
Wild Fire	9	12
Extreme Temperature	24	11
Volcanoes	6	8
Mass Movement: Dry	1	2
Total	367	346

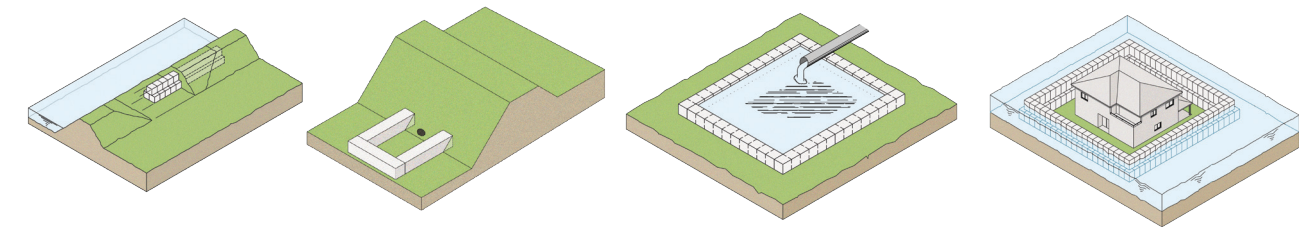
FLEXMAC® DT EMERGENCY WORKS

Maccaferri **FlexMac® DT** offers an efficient and effective response to these phenomena.

FlexMac® DT for flood and emergency works:

- Rapid and simple to deploy
- Flexible and light
- Simple connection between units
- Uses locally available fill material
- Easy transportation
- Re-usable

FlexMac® DT is used to rapidly construct large barriers to protect assets from rising flood water. Filled on-site using locally available materials, **FlexMac® DT** is up to 40 times faster to construct than sandbags.



The versatility of **FlexMac® DT** enables it to be an effective solution for many emergency situations involving flooding. The main applications of **FlexMac® DT** are as follows:

- Floods
- Emergency river works
- Landslide and erosion control or emergency works
- Bank restoration
- Emergency dam problems
- Coastal erosion
- Protection of plants and storage facilities
- Provision of basins for sediment storage
- Ground failure control

Within these emergency situations, **FlexMac® DT** can also be used in sympathy with other Maccaferri solutions and products.

RELIABILITY

Since 1893, with the installation of early gabions on the River Reno in Italy, Maccaferri has developed and enhanced its know-how in hydraulic and flood engineering.

The heritage of **FlexMac® DT** can be traced back to the early 1900's, when the solution was used in place of sandbags.

Maccaferri solutions are used successfully every day around the world. Its products are made with high quality materials and comply with the most rigorous international standards.

“To deal with flood and emergency situations, speed and efficiency of installation are vital.”

SPEED OF RESPONSE

The versatility, simplicity and rapid deployment of FlexMac®DT make it ideal for emergency situations.

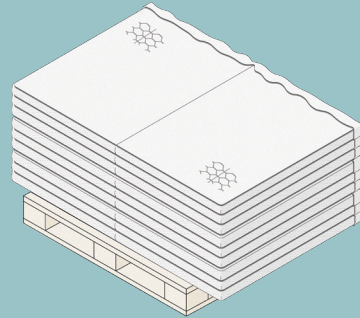
FlexMac®DT is a multicellular structure engineered from double twisted wire mesh which is reinforced with vertical steel bars and internally lined with geotextile. The geotextile lining enables FlexMac®DT to be filled with locally available materials such as sand, general fill or other materials. These can be easily placed within the structure using mechanical means or by workers.

The simplicity of the structure as well as its lightness enables FlexMac®DT to be deployed easily and quickly assembled without the need of trained labour or special equipment. As it does not have a base panel (the fill material is placed on the geotextile skirt within the cells), FlexMac®DT can be easily emptied and removed for storage and reuse.

The global presence and manufacturing facilities of Maccaferri around the world support a rapid and cost effective response to an emergency. FlexMac®DT is delivered to site in wrapped bundles, ready for use.

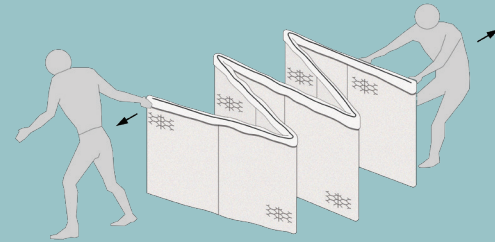
4 EASY DEPLOYMENT AND EASY FILLING

1. Unpack bundle



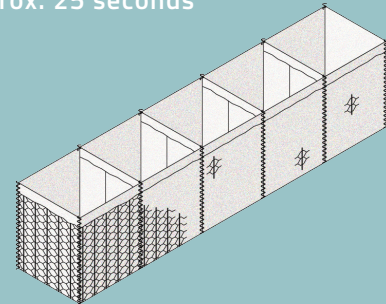
2. Open unit

Minimal labour requirement;
2-3 people



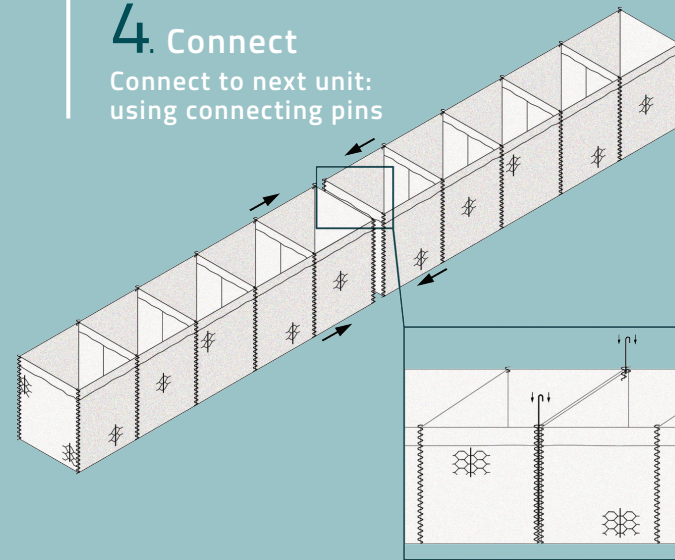
3. Fill

Short assembly time:
approx. 25 seconds



4. Connect

Connect to next unit:
using connecting pins



Manual and rapid transportation of the unit



FlexMac® DT unit ready for filling (5.0x1.0x1.0m type)



Filling operation



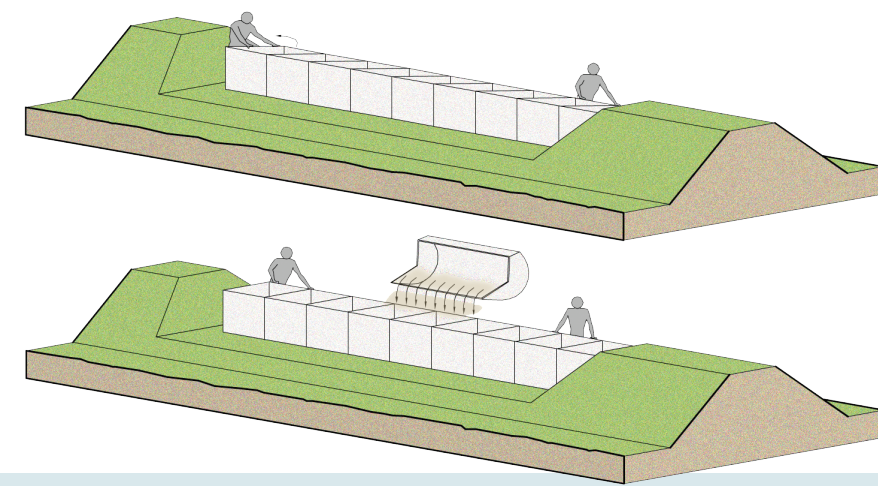
PRODUCTIVITY FLEXMAC®DT VS SANDBAGS

The great advantage of FlexMac®DT is clear when compared with traditional sandbags. In 3 hours, 30 people can construct a 10m embankment using sandbags, compared with 5 people constructing a 60m embankment using FlexMac®DT units. To deploy and assemble a single unit requires only 2-3 people and 20-30 seconds.

FlexMac®DT



3 hours
5 person team
60 metres

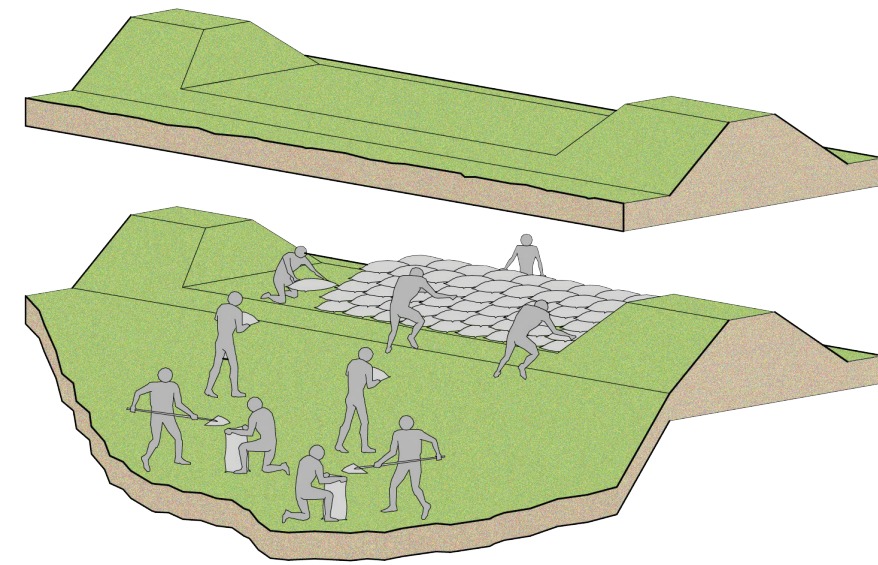


VS

Sandbags



3 hours
30 person team
10 metres



TECHNICAL DETAILS OF PRODUCT

FlexMac®DT is a modular structure made from double twisted, heavily galvanised steel wire mesh panels, reinforced with vertical steel bars. The cells are connected together in the factory and then folded to reduce shipping volume and facilitate rapid deployment.

Each cell within the FlexMac®DT unit, is lined with a geotextile which is fastened to the double twist wire hexagonal mesh during the manufacturing process. Flexmac®DT units are supplied in bundles and wrapped in plastic for protection during freight and storage.

FlexMac® DT characteristics	
Mesh Type	8x10 Type mesh. 3.0 mm Ø wire
Vertical reinforcing bars	4.9mm Ø
Geotextile liner	250 g/m²
Height (when deployed)	0.5 m - 1.4 m (varies per unit type)
Length (when deployed)	Multiples of 0.5 - 1.0 m lengths
Width	0.5 - 1.0 m (varies per unit type)
Advantages of hexagonal double twist mesh	
1. More flexible compared to welded mesh units	
2. Minimal foundation preparation required prior to deployment & filling	
3. Damage to wires does not compromise overall stability of system	
4. Can accommodate differential settlements	
5. Integral reinforcing bars, stiffen the structure	
6. 250 g/m² geotextile provides robust containment of fill materials	

RETURNING THE AREA TO NORMAL

After temporary use, FlexMac®DT can be folded up and efficiently stored for another emergency.

FlexMac®DT can be a temporary or permanent solution. When used as a permanent solution after the emergency has passed, FlexMac®DT would be covered and re-vegetated in harmony with the environment.

Other Maccaferri solutions are also used as part of post-hazard rehabilitation measures:

- M Erosion protection (TRM) blankets and mats
- M MacTube® containment tubes
- M Retaining structures
- M Soil reinforcement
- M Ground stabilisation

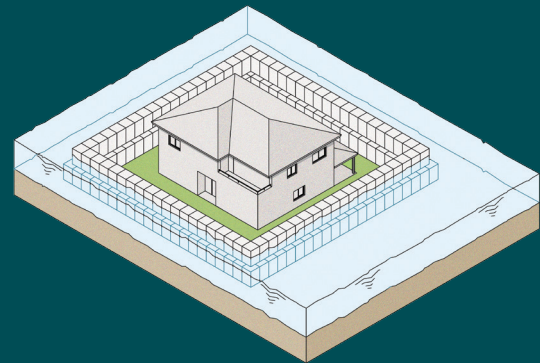


PROJECT EXPERIENCE GREAT FALLS, WASHINGTON DC, USA

SOLUTION

Protection of ancient building

Hurricane Isabel caused increased water levels in the Potomac River, threatening buildings in the C&O National Park. FlexMac® DT was deployed with waterproof membranes to protect structures.

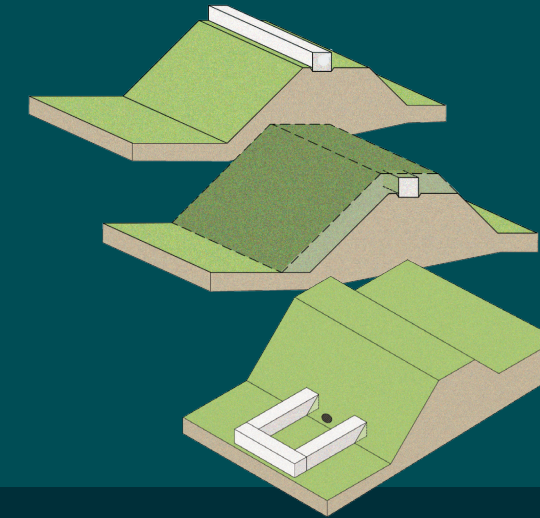


PROJECT EXPERIENCE SAMOGGIA RIVER, ITALY

SOLUTION

Raising and repair of breached embankment

Rising water breached the left embankment of the river. The embankment also experienced seepage through it. The embankment was raised and seepage contained and repaired.



PROJECT EXPERIENCE

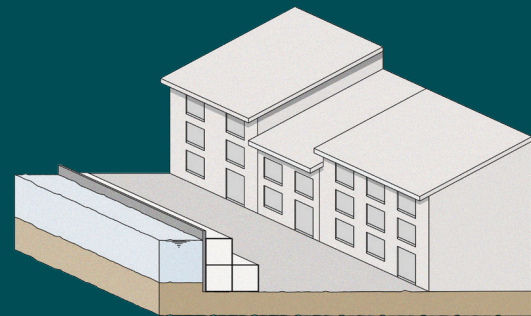
GDANSK, POLAND

SOLUTION

River bank protection

Extreme rainfall caused washout of structures. FlexMac® DT was used to shore up defences, increase channel capacity and contain flows.

The filled units were then covered with soil to form a reinforced embankment.



PROJECT EXPERIENCE

PESCIA ROMANA, ITALY

SOLUTION

River bank protection

The crest level of the river embankment was raised to increase the capacity of flow.

The structure was covered in soil and revegetated to blend back into the environment.

