Perimeter Flood Barrier – Muscle Walls

Gravity walls are free standing barriers that rely on their self-weight to generate friction to resist lateral flood loads. This classification of walls includes bags and ridged containers that can be filled with sand or water. Gravity walls are transported to site empty and then filled on site with sand or water. Gravity wall deployment requirements vary substantially by system and scale of installation.

Relation to Adaptation and Resiliency

Helps achieve protection of structures/facilities in the event of floods or natural disasters at the ground level.

Benefits

Gravity wall flood barriers can be deployed temporarily, and most can be easily reused.

Limiting Factors (Constraints)

- Flood water depths for these systems varies widely, and while most systems aren't designed to retain more than 6-feet of flood water, other gravity wall systems can retain a greater depth of flood water. Gravity walls rely on their self-weight to prevent overturning and typically have an aspect ratio (height to width) less than one.
- Gravity wall systems may or may not be stored at the point of use. Therefore, consideration should be given to storage and a means to transport the units to where they are needed.
- Ground condition requirements vary per system. Traditional sandbags are the most versatile in their ability to accommodate uneven ground surfaces. Larger 1-ton sandbags and water filled bags can also accommodate uneven ground surfaces, but due to the size of the units, they are less accommodating than the small sandbags. Ridged units are the least accommodating system with respect to uneven ground surfaces and perform best on flat, level surfaces such as streets, sidewalks, or parking lots.

Design & Preliminary Costs

Design requirements vary per system. Proprietary systems are typically designed for a specific use and care should be taken to ensure that deployment of the system is in-line with the manufacturer's recommendations. Other systems, such as stacked 1-ton sandbags may require an engineer to develop installation requirements and parameters. In addition, some gravity walls may require plastic cover to function properly.

Costs for gravity wall flood barriers vary substantially based on the type of system and scale of installation. Water-filled systems for 24" tall walls are approximately $50/LF and exceed $500/LF for walls approaching 96". Soil-filled systems for 24" tall walls are approximately $25/LF and approach $50/LF for 84" walls (Source: Cost data for systems like the FS36 came from PS Flood Barriers). Additional costs to consider are storage, deployment transport, installation and removal, monitoring and maintenance during deployment, and potential reuse.

Permits & Approvals

No known special permits/approvals.

Implementation

Implementation of gravity walls varies based on type of system and scale of application. Sandbags or water-filled plastic tubes can be installed by untrained personal and hand tools, but larger 1-ton sandbags require heavy construction equipment to fill and place. Larger water tubes require access to fire hydrants or large quantities of pressurized water.

Maintenance Requirements

- Little maintenance of gravity walls is required if stored in appropriate conditions.
- Staff should be trained each year.
- Deployed systems should undergo regular inspection and maintenance.

Useful Life

Useful life varies substantially by system; however, a shelf life of 25 to 50 years is achievable with most systems. Deployed service life also varies by system. Gravity walls can be designed to be very robust and remain in service for more than a year. Gravity walls intended for longer installation should be designed to be UV resistant.

References/Specifications

- Flood Defense Group – Muscle Walls
- Muscle Walls