

13 | Consolidation of structures

Environmental impact	2/3
Risk protection	2/3
Durability	1/3
Affordability	2/3

Intro

The consolidation of structures on the shelter/block level is directed at a single building or housing cluster. Where the elevation of shelters is not possible, consolidating interventions can mitigate the impact of floods on the built infrastructures. Such small-scale interventions include dry and wet floodproofing as well as permanent flood walls and levees.

Dry floodproofing focuses on protecting the walls and openings of a building against the impact of incoming water. The goal is that the water cannot enter the structure. In the context of dry floodproofing, the use of sacrificial layers is important. They are designed to be ‘sacrificed’ or replaced after flood events. The goal is to protect and mitigate the damage to the more essential parts of the shelter while reducing repair costs. Sacrificial layers include interventions such as outer wall layers, door-protection gates, flood-resistant coatings, watertight doors, and walls, or temporary flood barriers such as sandbags (See also *measure [14]*). The process of wet floodproofing means allowing floodwater to enter the built infrastructure without the risk of damage. Such interventions include using flood-resistant materials, protected utilities, or openings in the structure.

Manent floodwalls and levees small, permanent floodwalls (made from concrete or steel) and levees (made from earth) are placed along the riverbanks to protect the adjacent built infrastructure from flooding. Levees can also be erected around the shelter or block where the structures are most prone to flooding or ponds. Watertight materials for these barriers include clay, mud, concrete, masonry, or steel.

Benefits and Risk

The benefits of dry and wet floodproofing are that they are comparatively less expensive than other retrofitting interventions. However, wet and dry floodproofing can have the disadvantage that they require regular maintenance and that, despite the interventions, evacuation is needed during floods. In addition, wet floodproofing can lead to contamination inside the buildings by sewage or chemical materials that can be part of the floodwaters. It needs a lot of cleaning and can result in uninhabitable shelters for a period of time.

Good practice

Sacrificial Layers In Bangladesh

In Bangladesh, Caritas led a shelter response project for refugees from Myanmar. Among other measures, the project that was carried out in 2018, worked with sacrificial layers in the camps while fostering local building traditions and shelter solutions. However, the project also looked at the improvement of housing conditions and provided recommendations for shelter response, for example, after the monsoon. In this light, one finding is that using cement screed to plaster mud walls is not a good idea because the materials do not hold together, and with the cement, the mud cannot dry since it is not permeable to humidity.

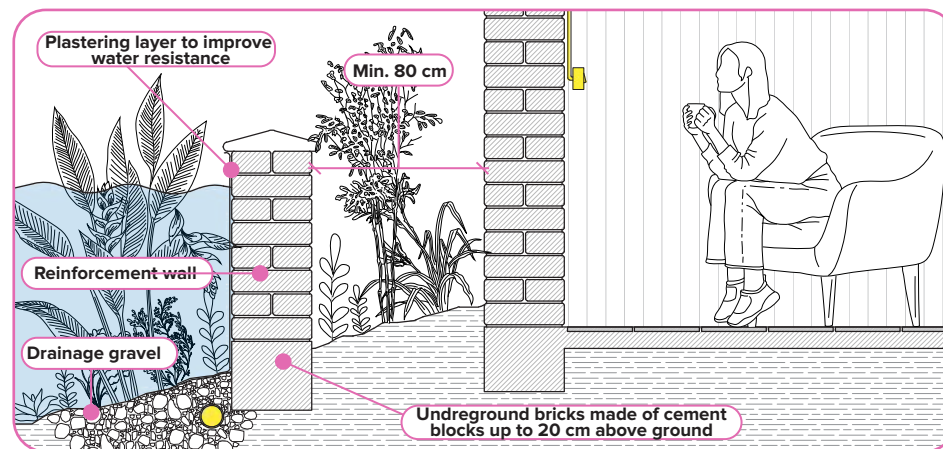
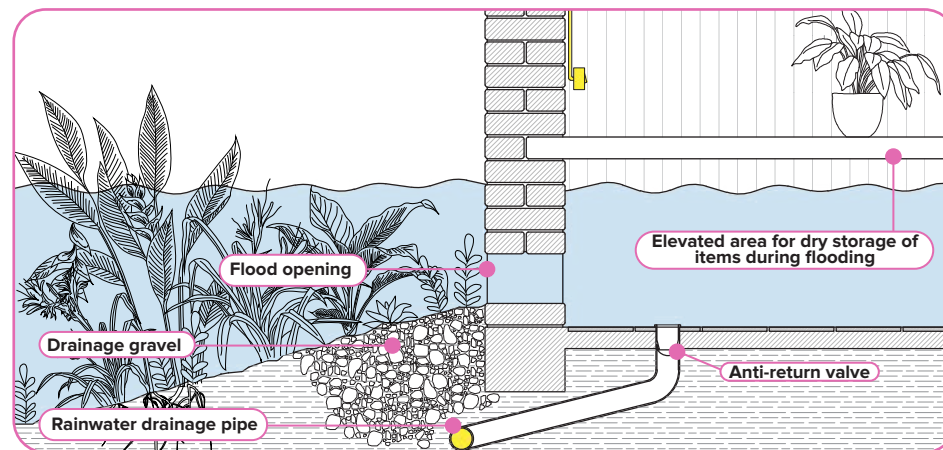
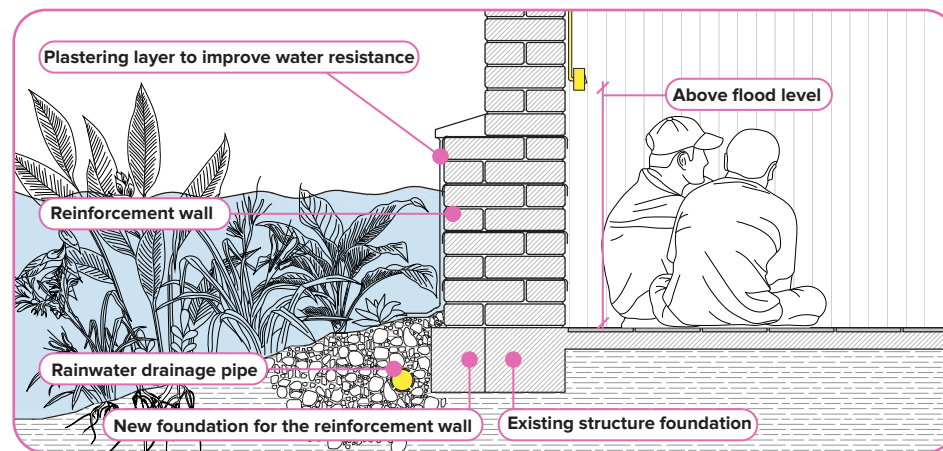




Fig. 11: Traditional house in Bangladesh with a double sacrificial layer. J. Horta, CRAterre, 2018.



Fig. 12: Structure consolidation through reuse in the refugee camps. E. Cauderay, CRAterre, 2019.



Fig. 13: Structure consolidation through reuse in the refugee camps. E. Cauderay, CRAterre, 2019.



Fig. 14: Structure consolidation in refugee camps sometimes requires a lot of reinforcement. E. Cauderay, CRAterre, 2019.

Overview of Criteria

Type of Intervention:

Engineered, hybrid.

Scale of Intervention:

Shelter-Plot-Block.

Materials:

Clay, mud, concrete, brick masonry, steel, plastic/geotextile sheets (selection)

Environmental Impact:

NA

Targeted Natural Hazard:

Pluvial Flood, Coastal/Riverine Flood.

Targeted Vulnerable Assets:

Buildings.

Strategy Type:

Reduce Asset Vulnerability.

Implementation Time:

Short (1 day - 1 month).

Effect Duration:

Short-term (<1 year), Medium-term (1 year to 10 years).

Investment Costs:

Low

Maintenance Costs (yearly):

Medium (10-50%)

FEMA (2021)

Wet Floodproofing.

Available online at

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FloodWise (2023)

Dry Floodproofing (Dry Floodproofing).

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Serlet, Murielle (2020)

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<https://craterre.hypotheses.org/2498>, updated on 2020.

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South Sudan - State-of-the-Art on Flood Resilient Shelters.



Flood Risk in Humanitarian Settlements: Compendium of Mitigation Measures

Spatial Development and Urban Policy, SPUR

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