

Levees and Floodwalls

Levees and floodwalls are barriers that hold back floodwaters. A levee is constructed of compacted soil and requires more land area. Floodwalls are built of manmade materials, such as concrete and masonry. These structures may completely surround the building or may tie into high ground at each end. If openings are left for the driveway and/or sidewalk, closures must be installed to seal these access points prior to a flood.

Applicability

Because levees and floodwalls are located away from the structure or area to be protected, they provide flood protection without altering the building.

Flood hazard: Although levees and floodwalls can be built to any height, they are usually limited to four feet for floodwalls and six feet for levees (due to cost, aesthetics, access, water pressure, and space). The structure should be built at least one foot higher than the anticipated flood depth (freeboard protection). No matter how high the barrier is, it can always be overtopped by a larger flood, which would cause as much damage as if no protection were provided (or more). In areas with high velocity flow, erosion protection may be necessary to protect an earthen levee or prevent undermining of a floodwall. Flash flooding precludes the use of closures that require human intervention to install. If flooding lasts more than 3 to 4 days, seepage is more likely to pose problems.

Site requirements: A levee or floodwall is not feasible if it would impede flow or block natural drainage in a manner that results in damage to surrounding property. Considerable horizontal space is required for levees; floodwalls are generally more appropriate for small sites. The underlying soil must support the levee or floodwall and resist seepage of water under the structure.

Building characteristics: A house with a basement can still experience flood damage even if a levee or floodwater protects the structure from surface water. Saturated soil can exert hydrostatic pressure on basement walls, causing them to crack, buckle, or even collapse.

Access: Access to the structure can be enabled by providing a means of crossing over a levee or floodwall, such as a ramp or stairway. If this is not feasible, it may be necessary to design openings at driveways, sidewalks, or other entrances and a mechanism for closing all such openings. Designs that do not require human intervention are preferable. If a closure requires manual installation, the effectiveness of the flood protection system depends on the availability of a capable person who is aware of the flood threat and has sufficient time to install closures and make certain they are properly sealed.



Aesthetics: The rounded outlines of an earthen levee can be shaped to blend into the natural landscape. Floodwalls can be designed as attractive features by incorporating them into the landscape design and utilizing decorative bricks or blocks (although this will generally increase the cost).

Regulations: A levee or floodwall cannot be used to bring a substantially damaged or substantially improved structure into compliance with current floodplain development standards.

Costs

Depending on the availability of suitable local soil, levees may be less expensive than other floodproofing options. However, if suitable fill material is not locally available, the expense of transporting proper material to the site can be significant. The cost of floodwalls is usually greater than that of levees.

Techniques

- **Levees:** To be effective, a levee must be constructed with compacted, impervious soils. The practice of piling stream sediment on the bank does not provide flood protection. The embankment slopes must be gentle (usually a ratio of one vertical to two or three horizontal) to provide adequate stability and minimize erosion. The levee's width will thus be several times its height.
- **Floodwalls:** Floodwalls are generally constructed of solid concrete (alone or in combination with masonry). They must be designed to withstand water pressure without overturning or displacement.
- **Closures:** Mechanisms for closing access openings in a levee or floodwall include automated systems (usually expensive) or manually operated flood gates, stop logs, or panels. There are often hinges or sliding mechanisms for installation. If the closure is not permanently attached, it must be stored in a readily accessible location. Any sewers or drain pipes passing through or under a floodwall or levee require closure valves to prevent backup and flooding inside the building and protected area.
- **Interior drainage:** Rain, snow melt, and seepage water must be removed from the protected side of a levee or floodwall using drains (with flap valves to prevent backflow during a flood) and a sump pump. An emergency power source for the electric sump pump enables operation during a power outage.
- **Maintenance:** Routine inspection enables identification and repair of problems while they are still minor. Levees should be checked for signs of erosion, settlement, loss of vegetation, animal burrows, and trees. Inspect floodwalls for cracking, spalling, or scour. Routine maintenance is needed to make sure that sump pumps, valves, drain pipes, and closures operate properly.

Advantages and Disadvantages of Levees and Floodwalls

Advantages	Disadvantages
<ul style="list-style-type: none"> ● Levees and floodwalls can protect a building and the surrounding area from inundation without significant changes to the structure <u>if</u> the design flood level is not exceeded. ● There is no pressure from floodwater to cause structural damage to the building. ● These barriers are usually less expensive than elevating or relocating the structure. ● Occupants do not have to leave the structure during construction. 	<ul style="list-style-type: none"> ● This technique cannot be used to bring a substantially damaged or improved structure into compliance with floodplain development standards. ● May violate floodplain development standards, particularly in floodway locations, by causing obstructed flow or in increased flood heights. ● Failure or overtopping of a levee or floodwall results in as much damage as if there was no protection (or more). ● May restrict access to the structure. If human intervention is required for closures, there must be adequate warning time. ● May be expensive. ● For buildings with basements, hydrostatic pressure from groundwater may still cause damage. ● Local drainage can be affected, possibly creating water problems for others. ● Interior drainage must be provided. ● Levees require considerable land area. ● Require periodic maintenance. ● No reduction in flood insurance premiums. ● Do not eliminate the need to evacuate during floods.