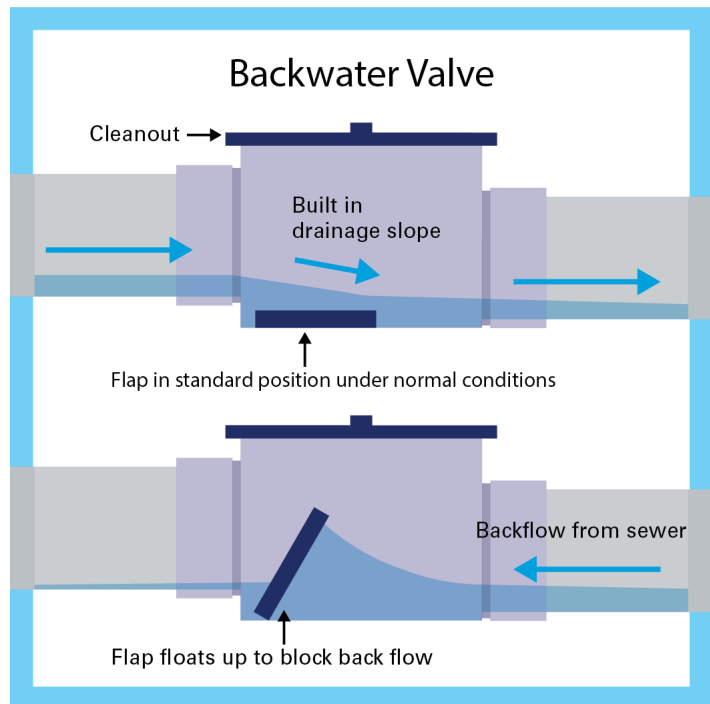


Tompkins County Resiliency and Recovery Plan

Backwater Valve Fact Sheet

Backwater Valves¹ – As described in FEMA’s Risk Management Series Design Guide, a sewer backwater preventer keeps sewer water out even when the pressure in the pipes build up. Backwater valves are designed to close when you need them to, preventing any water from getting into your structure’s sewer lines, overwhelming the pipes, and flooding your building. All backwater valves work through a combination of correct installation and regular maintenance. Without proper installation and maintenance, a backwater valve will not work. Much like an exterior door, backwater valves are intended to provide protection in the form of a physical barrier ([FEMA 2007](#)).

Public sewers cannot be designed to be able to immediately divert any amount of heavy rain. In many cases the cost of building extremely large sewer would be unjustifiably high. Therefore, in such heavy rain, a short-term overload of the sewer network, and thus, a backwater in the land drainage systems must be accepted. Even if there has never been an overflow of the public sewer, risk of potential clogging remains, spilling into private systems and causing costly damages still exists ([Flood Ready n.d.](#)). Sewer backup can also result from ageing sewer networks that become blocked due to tree roots or larger foreign objects, pipe breakage, failure of a pumping stations or misuse from disposal of grease. Properties located in particularly dense neighborhoods and buildings in low lying areas may be particularly prone to sewer backup since these areas tend to be more reliant on the sewer networks operation for proper drainage ([Flood Ready n.d.](#)).



¹ Photo from EPCOR Utilities Inc Flood Prevention Homeowner Maintenance Resource. Accessible at <https://www.epcor.com/products-services/drainage/flooding-flood-prevention/flood-prevention-homeowner-maintenance/Pages/backwater-valve.aspx>

Tompkins County Resiliency and Recovery Plan

Utility Floodproofing Fact Sheet



Utility Floodproofing (Elevation and Door Dam)² – Elevating a utility involves elevating vulnerable components of the systems by placing them on a higher platform away from flood waters. For new construction and *Substantially Improved* buildings, the most practical method to protect service equipment from flooding is to elevate above the required flood protection level, or provide dry floodproofing that protects equipment to the required flood protection level ([FEMA 2007](#)).

Service equipment can be elevated in place or relocated to a higher level in the building. Relocation achieves greater flood protection; therefore, it is generally more effective at reducing flood risk. However, relocating service equipment to a higher floor requires space to be created for the equipment, which often requires relocating existing equipment or functions on that floor to areas with greater flood risk. In place elevation is usually easier, but the level of achievable flood protection is generally lower. When elevating in place, access to service equipment and working clearance around the equipment needs to be maintained ([FEMA 2007](#)).

² Photo from Flood Control International Case Studies. Accessible at <https://floodcontrolinternational.com/case-studies/utility-sites/>

Tompkins County Resiliency and Recovery Plan

Mobilized Flood Walls Fact Sheet



Mobilized Flood Walls³ – Temporary flood walls can be deployed to protect structures in the event of flood waters. This category of flood protection measures includes fully engineered flood protection structures that have permanent features (foundation and vertical supports) and features that require human intervention when a flood is predicted (horizontal components called planks or stop-logs). Mobilized floodwalls have been used to protect entire sites, or to tie into permanent floodwalls or high ground. Because of the manpower and time required for proper placement, these measures are better suited to conditions that allow long warning times ([FEMA 2007](#)).

³ Photo from AquaFence Integrated Flood Shield. Accessible at <https://floodcontrolinternational.com/case-studies/utility-sites/>.

Tompkins County Resiliency and Recovery Plan

Permanent Flood Walls Fact Sheet



Permanent Flood Walls⁴ – Floodwalls are freestanding, permanent engineered structures that are designed to prevent encroachment of floodwaters. Typically, a floodwall is located some distance from a building, so that structural modification of the existing building is not required. Floodwalls may protect only the low side of a site (in which case they must “tie” into high ground) or surround a site (which may affect access because special closure structures are required and must be installed before the onset of flooding) ([FEMA 2007](#)).

⁴ Photo from Czech Republic. Accessible at https://en.wikipedia.org/wiki/Flood_wall#/media/File:Zru%C4%8D_nad_S%C3%A1zavou,_Ostrovsk%C3%BD_poto_k,_u_Vla%C5%A1imsk%C3%A9_ulice.jpg

Tompkins County Resiliency and Recovery Plan

Flood Gates Fact Sheet



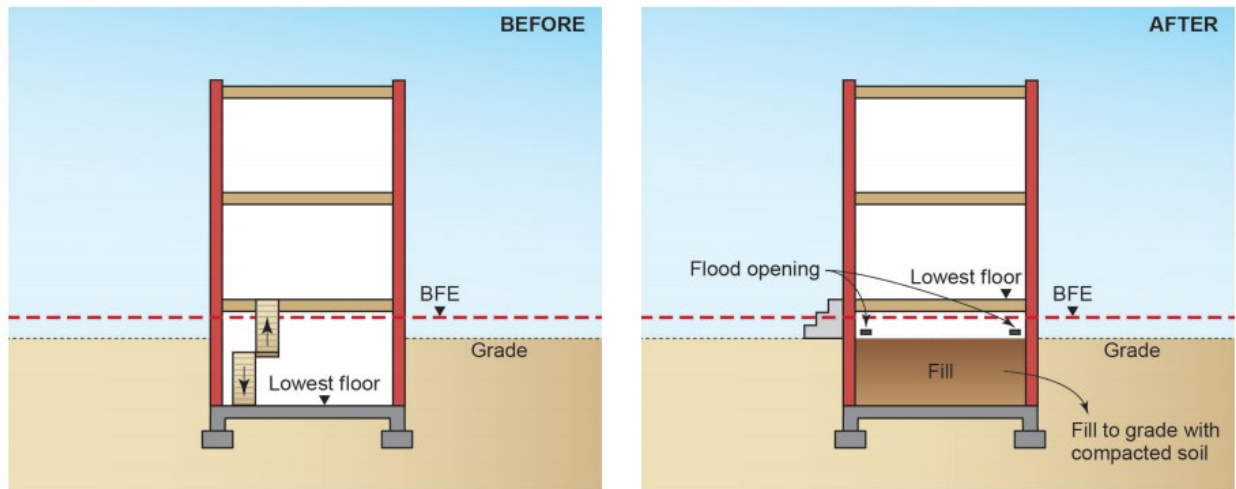
Flood Gates⁵ – A flood gate is responsible for shutting out or releasing the flow of water over spillways, related to the operation of a dam. Important safety features of many types of dams, flood gates and spillways direct excess water away from the dam and its foundation to prevent erosion that could lead to catastrophic dam failure ([Encyclopedia Britannica n.d.](#)).

Several forms of gates have been developed. The simplest and oldest form is a vertical-lift gate that, sliding or rolling against guides, can be raised to allow water to flow underneath. Radial, or tainter, gates are similar in principle but are curved in vertical section to better resist water pressure. Tilting gates consist of flaps held by hinges along their lower edges that permit water to flow over the top when they are lowered. Vertical lift and radial gates are generally placed at the top of the spillway crest ([Encyclopedia Britannica n.d.](#)).

⁵ Photo of Mansfield Dam floodgates at Lake Travis (Colorado). Accessible at <https://www.golaketravis.com/news.php?id=2990>.

Tompkins County Resiliency and Recovery Plan

Basement Infill Fact Sheet

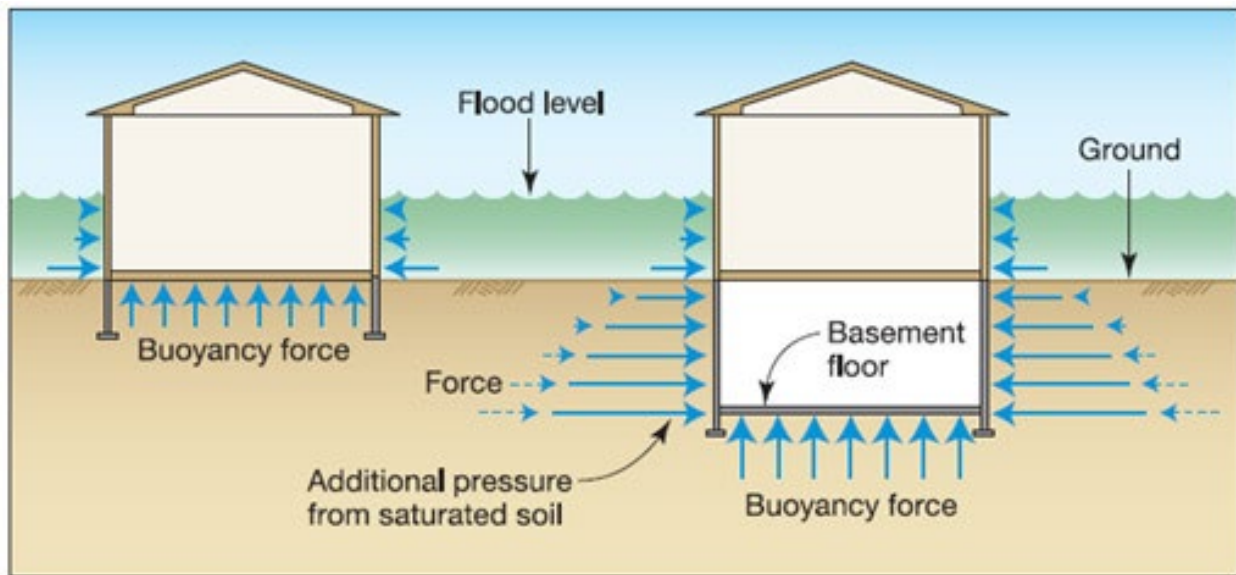


Basement Infill⁶ – Basement infill measures involve filling a basement located below the Base Flood Elevation (BFE) to grade (ground level). Sections of the basement walls that remain above ground must be retrofitted with flood openings that allow automatic entry and/or exit of floodwaters (refer to the Flood Openings section for details). Any basement utility systems and associated equipment must be elevated to protect utilities from damage or loss of function from flooding. Basement infill has been proven to be effective at reducing damages to building elements and contents located below the BFE since the lowest floor can potentially be re-located above the BFE ([FEMA 2007](#)).

⁶ Photo from FEMA 2007 Resource Document.

Tompkins County Resiliency and Recovery Plan

Dry Floodproofing Fact Sheet



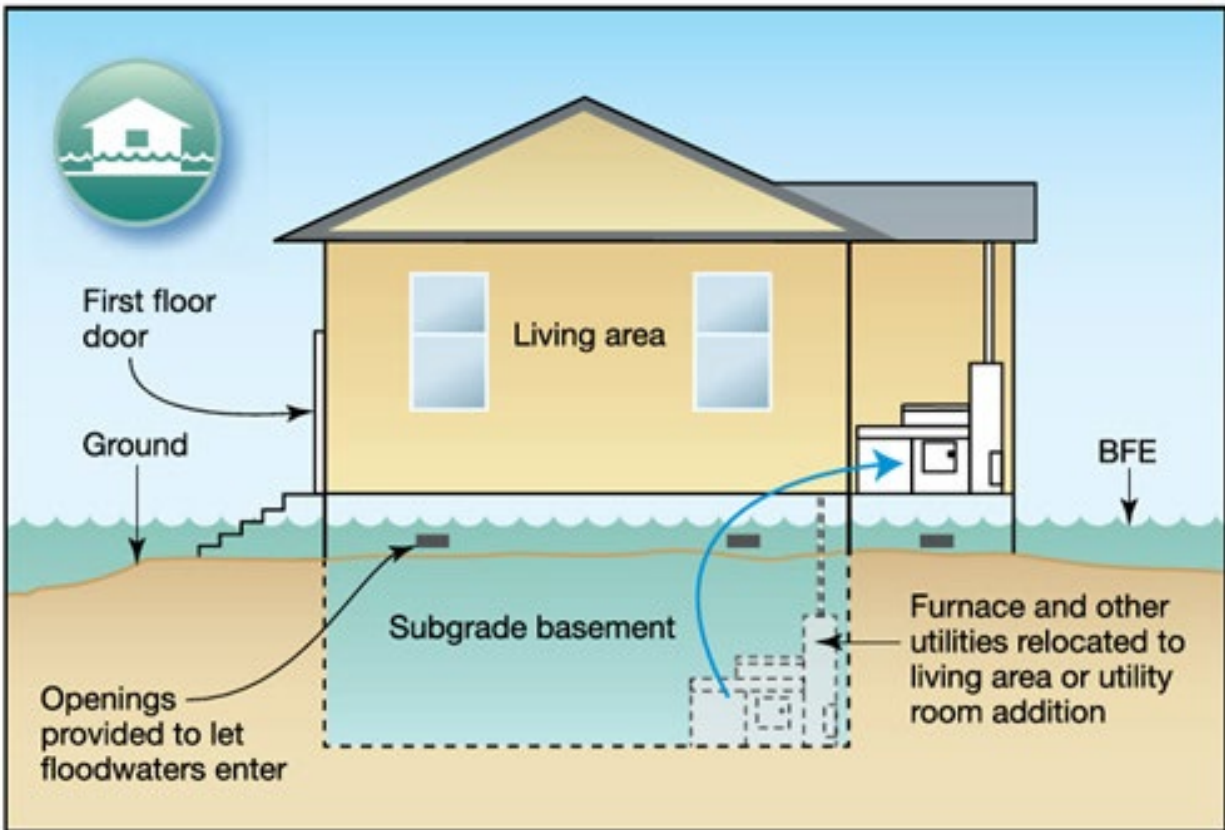
Dry Floodproofing⁷ - Includes measures that make a structure watertight below the level that needs flood protection to prevent floodwaters from entering. This type of floodproofing is often used to protect non-residential structures, water supplies, and sewage systems. Dry floodproofing may not be used to bring a *Substantially Damaged* or *Substantially Improved* residential structure into compliance with the community's floodplain ordinance. However, it can meet requirements for non-residential and commercial structures ([FEMA 2007](#)).

An example of a dry floodproofing measure is to apply a waterproof veneer, such as a layer of brick backed by a waterproof membrane, directly to the outside surface of an existing structure. (Photo shows home under construction with weatherproof membrane and brick veneer used to protect the structure.) Flooding can cause sewage from sewer lines to back up through drainpipes. These backups not only cause damage that is difficult to repair, but they also create health hazards. One way to protect against this hazard is to install backflow valves, which temporarily block drainpipes if water travels up them the wrong way. If a structure's lowest level has a floor drain that empties to the exterior of the building, installing a floating floor-drain plug can also prevent flood waters from backing up the drainpipe and entering the structure ([FEMA 2007](#)).

⁷ Photo from FEMA 2007 Resource Document.

Tompkins County Resiliency and Recovery Plan

Wet Floodproofing Fact Sheet



Wet Floodproofing⁸ – Wet Floodproofing includes permanent or contingent measures applied to a structure, or its contents, that prevent or provide resistance to damage from flooding while allowing floodwaters to enter the structure or area. Generally, this includes properly anchoring the structure, using flood resistant materials below the Base Flood Elevation (BFE), protection of mechanical and utility equipment, and use of openings or breakaway walls. Application of wet floodproofing as a flood protection technique under the National Flood Insurance Program (NFIP) is limited to enclosures below elevated residential and non-residential structures and to accessory and agricultural structures that have been issued variances by the community ([FEMA 2007](#)).

The benefit of wet floodproofing is that if flood waters are allowed to enter the enclosed areas of the house and to quickly reach the same level as the flood waters outside, the effects of hydrostatic pressure, including buoyancy, are greatly reduced. As a result, the loads imposed on the structure during a flood, and therefore the likelihood of structural damage, may be greatly reduced ([FEMA 2007](#)).

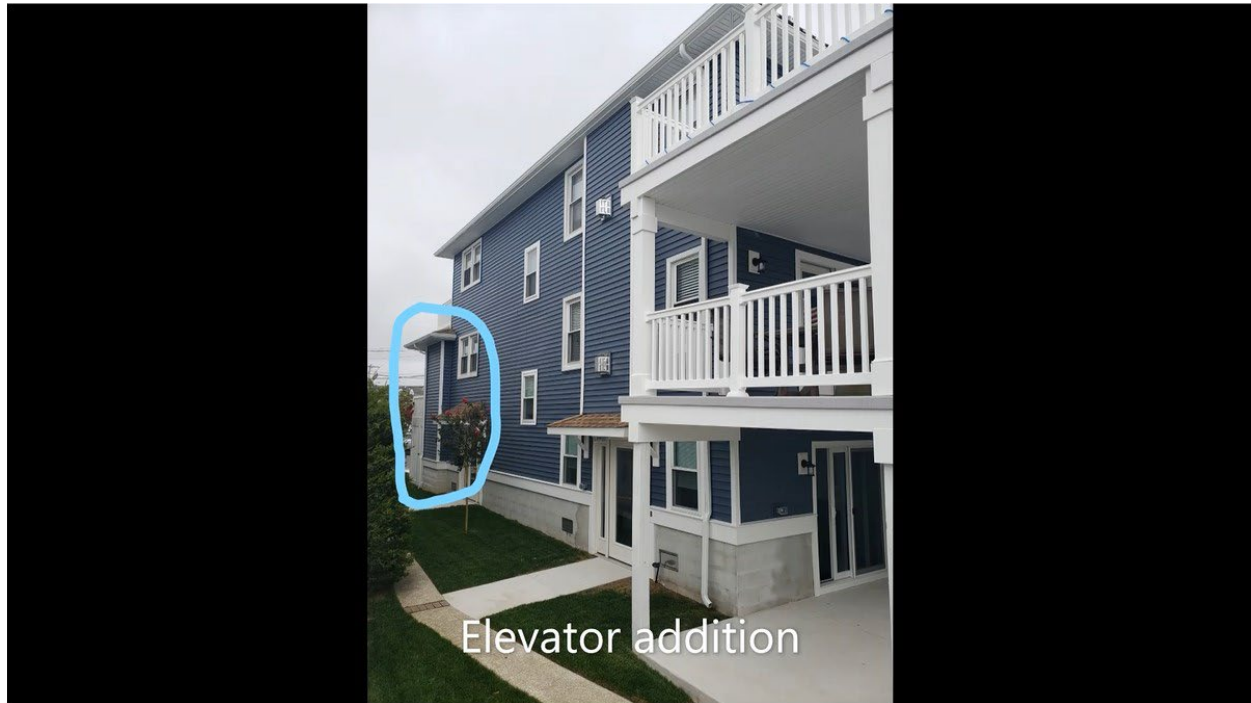
⁸ Photo from FEMA's *Design Guide for Improving Critical Facility Safety from Flooding and High Winds* (2007).



Department
of State

The factsheet was prepared with funding provided by the New York State Department of State under Title 3 of the Environmental Protection Fund.

Tompkins County Resiliency and Recovery Plan Additions Fact Sheet



Additions⁹ – To mitigate the effects of flooding, additions (i.e., ramps, stairs, elevators, etc.) can be added to a building. Building codes typically treat additions as new construction and require additions in critical facilities in flood hazard areas to be elevated or dry floodproofed to minimize flooding exposure. However, full compliance with building codes and NFIP is only required if the addition counts as *Substantially Improved* ([FEMA 2007](#)).

⁹ Photo from Ocean City, Jonas Hazard Mitigation Grant Program Elevations Project