



Nonstructural Flood Risk Management

Nonstructural flood risk management measures are proven methods and techniques for reducing flood risk and flood damages by adapting to the natural characteristics of flooding within the floodplain. In addition to being very effective for both short and long term flood risk and flood damage reduction, nonstructural measures can be very cost effective when compared to other flood risk management techniques.

$$\text{Risk} = f[(\text{Probability of Flooding}) \times (\text{Consequences})]$$

Probability of Flooding is the frequency of flooding or how often does flooding occur in a particular location.

Consequences are the potential life loss or damages associated with flooding. Structures (residential, commercial, critical, public, and industrial), land use (agricultural, urban, public), and infrastructure (highways, roads, rail, utilities) are potentially damageable assets. Reduce the consequences of flooding and risk is reduced. Nonstructural measures are invaluable wherein the goal is to reduce flood damages without modifying the characteristics of the flood event.

Nonstructural Measures

Nonstructural flood risk management can be categorized as a set of **physical** or **nonphysical** measures utilized for mitigating loss of life as well as existing and future flood damages. The physical measures determined to be most commonly implemented are those which adapt to the natural characteristics of the floodplain without adversely affecting or changing those natural flood characteristics. Because of their adaptive characteristics to flood risk, wherein these measures support the National Flood Insurance Program as administered by FEMA and generally cause no adverse affects to the floodplain, flood stages, velocities, or the environment these measures may also be considered as **Flood Risk Adaptive Measures** and can be incorporated into existing or new structures to mitigate for potential future flood damages. The most common Flood Risk Adaptive Measures are:

Elevation

This nonstructural technique lifts an existing structure to an elevation which is at least equal to or greater than the 1% annual chance flood elevation. In many elevation scenarios, the cost of elevating a structure an extra foot or two is less expensive than the first foot, due to the cost incurred for mobilizing equipment. Elevation can be performed using fill material, on extended foundation walls, on piers, post, piles and columns. Elevation is also a very successful technique for reinforced slab-on-grade structures.

Fill Basement with Main Floor Addition

This nonstructural technique consists of removal of the basement by filling. With this measure, placing an addition on the side of the structure could compensate for the lost basement space to the owner and contain utilities such as the furnace, water heater, water softener, etc. If the addition is prohibited because of limited space within the lot or because the owner did not want it, compensation for the lost basement space would be in order for the owner.

Relocation

This nonstructural technique requires physically moving the at-risk structure out of the floodplain and buying the land upon which the structure was located. Ensure that structures are relocated from a high flood hazard area to an area that is located completely out of the floodplain.

Acquisition

This nonstructural technique consists of buying the structure and the land. The structure is either demolished or is sold to others and moved to a site external to the floodplain. Development sites, if needed, can be part of a proposed project in order to provide locations where displaced people can build new homes within an established community.

Wet Flood Proofing

This nonstructural technique is applicable as either a stand-alone measure or as a measure combined with other measures such as elevation. As a stand-alone measure, floodwaters are allowed to enter a structure, thereby requiring that all construction materials be water resistant and all utilities must be elevated above the design flood elevation. Wet flood proofing is applicable to commercial and industrial structures when combined with a flood warning and flood preparedness plan. This measure is generally not applicable to large flood depths and high velocity flows.

Dry Floodproofing

This nonstructural technique consists of waterproofing to prevent water from entering. This measure achieves flood insurance premium reduction for commercial structures but is not recognized by the NFIP for flood insurance premium reduction if applied to a residential structure. A "conventional" built structure can generally only be dry flood proofed up to 3-feet in elevation. A structural analysis of the wall strength is required if it is desired to achieve higher protection. A sump pump and drain system should be installed as part of the measure to remove seepage, particularly at openings. Closure panels are used at openings. Buildings with basements and/or crawlspaces require additional design analyses.

The following nonphysical nonstructural measures are generally identified as being management measures for the floodplain. These measures can address flood risk through regulation and best management practices and can be considered separately or as a combination of floodplain management and planning functions.

Floodplain Mapping

This nonphysical nonstructural measure provides the identification of flood risk, whether in the form of a map which portrays flood boundaries, or as an inundation map illustrating the depth of flooding, this measure is a significant tool when addressing flood risk.

Flood Warning System

This nonstructural measure relies upon stream gage, rain gages, and hydrologic computer modeling to determine the impacts of flooding for areas of potential flood risk. A flood warning system, when properly installed and calibrated, is able to identify the time available for residents to safely implement temporary measures or to evacuate an area.

Flood Emergency Preparedness Plans

Local officials are encouraged to develop and maintain a flood emergency preparedness plan (FEPP) that identifies hazards, risks and vulnerabilities, and encourages the development of local mitigation. The FEPP should include the community's roles and responsibilities for responding to a flood event.

Land Use Regulations

Land use regulations are effective tools in reducing flood risk and flood damage. The principles of these tools are based in the National Flood Insurance Program (NFIP) which requires minimum standards of floodplain regulation.

Zoning

A community may determine that certain areas are too hazardous for human habitation and restrict development from occurring. This is a long-term investment tool for alleviating flood risk.

Evacuation Plans

This measure requires detailed hydrologic analyses for determining the rate of rise of floodwaters for various rainfall or snowmelt events. When used in conjunction with flood warning systems, this measure can provide significant loss of life avoidance and flood damage reduction benefits. Evacuation planning should consider vertical evacuation as well as the traditional horizontal evacuation. This measure should only be implemented when there is significant response and action time available for floodplain occupants to evacuate. Rally points as well as evacuation routes should be thoughtfully planned and communicated to the public.

Risk Communication

Through the development of and use of educational tools such as presentations, workshops, hand-outs, and pamphlets, flood risk and flood risk reduction measures may be communicated to government entities and floodplain occupants in an effort to reduce the consequences associated with flooding.