Nonstructural Flood Risk Management Measures

Nonstructural flood risk management measures are proven methods and techniques for reducing flood risk and flood damages by adapting to the 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.

Risk = *f* [(Probability of Flooding) x (Consequences)]

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

Consequences are the potential damages associated with flooding. Structures (residential, commercial, critical, public, and industrial), land use (agricultural, urban, public), and infrastructure (highways, roads, rail, utilities) are the 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

The following nonstructural measures represent techniques commonly utilized in reducing flood risk and the damages associated with flooding. These measures vary from removing a structure from the floodplain to insuring a structure permanently located within the floodplain. The costs associated with implementing a measure are often variable where the reduction of flood damages is proportional to the cost of the measure (i.e. removal of a structure from the floodplain will eliminate all future damages associated with flooding, but can be costly to implement).

Additionally, nonstructural measures can be considered to be **Flood Risk Adaptive Measures (FRAM)** due to their adaptation to the floodplain, wherein these measures support the National Flood Insurance Program as administered by FEMA and generally cause no adverse affects to the floodplain, flood stages, or the environment.

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 filling in the existing basement without elevating the remainder of the structure. This could occur if the structure's first floor was located above the base flood elevation. With this measure, placing an addition on to the side of the structure could compensate for the lost basement space to the owner and contain damageable 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. This measure is applicable where the design flood depth is moderate and the first floor elevation is already located above the design depth.

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 Floodproofing
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 floodproofing 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 the structure 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 floodproofed up to 3-feet in elevation. A structural analysis of the wall strength is required if it was desired to achieve higher protection. A sump pump and drain system should be installed as part of the measure. Closure panels are used at openings. For buildings with basements and/or crawlspaces, the only way that dry floodproofing could be achieved is for the first floor to be made impermeable to the passage of floodwater.

Berms and Floodwalls
This nonstructural technique is only applicable on a small-scale basis. As nonstructural measures, berms and floodwalls should never be constructed to higher than 5 feet above grade and should not be considered for certification through the NFIP, meaning that flood insurance and floodplain management requirements of the NFIP are still applicable in areas were these berms or floodwalls are constructed. These measures can be placed around a single structure or a small group of structures, but since the application of these measures is considered nonstructural in nature, they should not raise the water surface elevation of the 100-year flood.

Flood Warning System
This nonstructural technique 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 amount of time available for residents to implement emergency measures to protect valuables or to evacuate the area during serious flood events.

<u>Floodplain Management Measures</u>

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 response to flooding, location of evacuation centers, evacuation routes, and flood recovery processes.

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.

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