A Guide for Higher Standards in Floodplain Management

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Introduction

The purpose of the Guide for Higher Regulatory Standards in Floodplain Management is to provide options for communities that want to implement floodplain regulations which reduce flood damage and the overall impacts of floods. These impacts include human risk, environmental damage, property damage, flood insurance claims, displacement of residents, and burden on community infrastructure and services.

The Guide is not a substitute for a set of community floodplain regulations, rather it is a guide to enhancing existing regulations with higher standards that will greatly reduce risk, and provide protections to functional floodplains.

The higher standards options in this guide are described in detail because they are recommended for safer development and use the natural protection provided by the natural functions and resources of the floodplain. Please note that the model language presented in this document was developed to promote effective floodplain management, and mesh with the FEMA minimum flood damage reduction standards described in 44CFR§60.3. Each community can tailor the model language to meet its own specific needs.
A note about enforcement:

Higher regulatory standards are only as good as the enforcement process that supports them. Many of the higher regulatory standards suggested in this guide necessitate increased documentation requirements and enforcement efforts compared to the minimum NFIP standards.

ASFPM strongly believes the minimum NFIP floodplain regulations do not provide adequate long-term flood risk reduction for communities and that the benefits of flood risk reduction achieved by higher regulatory standards far outweighs the burden of administering them.

**ASFPM RECOMMENDED HIGHER REGULATORY STANDARDS**

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**I. FREEBOARD**

**OBJECTIVE:**
To at least minimally protect structures against damage from floods in floodplain areas with 1% annual (base) flood elevations and in areas where no 1%-annual-chance flood elevations are available.

**RATIONALE:**
Freeboard is the single most effective means for reducing flood risk to a structure in the floodplain. Freeboard is standard for placing the first floor of a structure above the elevation of the calculated 1% flood level in order to allow for nature’s uncertainty and future changes in the watershed that will increase flood levels. Freeboard is relatively inexpensive to build into development, and typically pays for itself in reduced insurance premiums and prevented flood damage within the first 10 years of a structure’s lifetime. Significant Community Rating System (CRS) credit is available for this activity, which leads to lower flood insurance premiums for all policy holders in the community.

**MODEL LANGUAGE:**
Add the following sentence (bolded) to specific requirements for Residential Structures and Non-Residential structures:

*New Construction and substantial improvement of any residential structure, including manufactured homes, shall have the lowest floor, including basement, elevated (1 or 2) feet above the base flood elevation. The base flood elevation is the level of the 1% flood. Where base flood elevation data are not available the structure shall have the lowest floor, including basement, elevated at least two feet above the highest adjacent natural grade.*

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**II. ACCESS (INGRESS-EGRESS)**

**OBJECTIVE:**
To promote development design which will reduce flood damage and facilitate emergency vehicular access and/or pedestrian access and evacuation during flood events.
RATIONALE:
Buildings in high risk floodplains can be elevated to reduce flood damage by elevating the building to higher standards, such as to or above the 1% flood level. However, residual risk remains on the property. Ensuring that building sites are relatively accessible during floods decreases the likelihood of stranded residents, reduces the need for water rescues which places emergency personnel at risk, and increases public safety.

MODEL LANGUAGE:
(1) Add to specific requirements for Residential Structures:

New development proposals will be designed, to the maximum extent practicable, so residential building sites, walkways, driveways, and roadways are located on land with a natural grade with elevation not less than the base flood elevation and with evacuation routes leading directly out of the floodplain area (dryland access).

(2) Add to specific requirements for Nonresidential Structures:

New development proposals will be designed, to the maximum extent practicable, so non-residential building sites, walkways, driveways, and roadways are located on land with a natural grade with elevation not less than the base flood elevation and with evacuation routes leading directly out of the floodplain area.

III. COMPENSATORY STORAGE

OBJECTIVE:
To compensate for the loss of floodplain storage caused by filling in the floodplain, which can result in raising flood elevations, especially with the impact of cumulative fills.

RATIONALE:
Floodplains provide the critical and beneficial functions of flood storage, natural habitat, and water quality. The placement of fill impairs these functions and should be avoided. Where some placement of fill is unavoidable, requiring compensatory storage can mitigate some of the negative impacts of floodplain fill.

MODEL LANGUAGE:
There are a number of versions of compensatory storage language. The following sample language is provided as developed from a review of existing regulations:

(1) Add to language for the Assurance of Flood Carrying Capacity:

Compensatory Storage Required for Fill

Fill within the area of special flood hazard shall result in no net loss of natural floodplain storage. The volume of the loss of floodwater storage due to filling in the
special flood hazard area shall be offset by providing an equal volume of flood storage by excavation or other compensatory measures at or adjacent to the development site.

(2) If your regulations explain the minimum application items necessary to seek a permit, add to the language for the Application Requirements section:

Volumetric calculations demonstrating compensatory storage.

IV. CRITICAL DEVELOPMENT PROTECTION

OBJECTIVE:
To protect critical facilities and development against damage, and to minimize the potential loss of life from flooding.

RATIONALE:
Facilities which provide critical services, or services that are depended on during storms, should be protected to an even higher standard than other development. Failure to provide flood protection to these types of critical facilities creates severe and unacceptable public safety risk.

MODEL LANGUAGE:
The standard used in Executive Order 11988 is the 500-year flood event, or the historically highest flood (if records are available), whichever is greater. Two alternatives are presented below, the first being less restrictive, the second being more restrictive:

(1) Add to Definitions:

**Critical Development**

*Critical development is that which is critical to the community’s public health and safety, are essential to the orderly functioning of a community, store or produce highly volatile, toxic or water-reactive materials, or house occupants that may be insufficiently mobile to avoid loss of life or injury. Examples of critical development include jails, hospitals, schools, daycare facilities, public electric utilities, fire stations, emergency operation centers, police facilities, nursing homes, wastewater treatment facilities, water plants, gas/oil/propane storage facilities, and other public equipment storage facilities.*

(2) Add to Use Regulations (Prohibited Uses):

[Option I]

*Critical facilities and developments in all special flood hazard areas. Where critical developments are located adjacent to special flood hazard areas, the flood protection elevation shall be two feet above the 0.2% flood elevation and that elevation shall be used as the basis for the ACCESS (INGRESS-EGRESS) provisions in section II.*
[Option II]

Critical facilities and developments in all special flood hazard areas, and in all 0.2% annual (500-year) floodplains.

V. CUMULATIVE SUBSTANTIAL DAMAGE / SUBSTANTIAL IMPROVEMENT

OBJECTIVE:
To track cumulative improvements or damages to structures in special flood hazard areas to ensure that flood protection measures are incorporated.

RATIONALE:
The vast majority of flood damages to structures amount to less than 50% of the value of the structure. Without cumulative substantial damage/improvement provisions, the cycle of flood-repair-flood is typically never broken by mitigating risk. The NFIP Increased Cost of Compliance provisions (provides added funds to substantially damaged flood insurance claims for mitigating the structure) are most effective in communities with cumulative provisions.

MODEL LANGUAGE:
(1) Add the following sentence at the end of the “substantial damage” definition:

Substantial Damage
Substantial damage also means flood related damage sustained by a structure on two (2) separate occasions during a 10-year period for which the cost of repairs at the time of each such flood event, on the average, equals or exceeds 25 percent of the market value of the structure before the damage occurred.

(2) Add the following sentence (bolded) to the “substantial improvement” definition:

Substantial Improvement
Any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the "start of construction" of the improvement. When the combined total of all improvements or repairs made after the adoption of this regulation equals or exceeds 50 percent of a structure’s market value, that structure is considered to be substantially improved.

VI. FILL STANDARDS

OBJECTIVE 1:
To provide guidelines for the placement of fill in special flood hazard areas.
RATIONALE:
Nearly all floodplain filling activities create negative consequences to adjacent areas. Improperly designed and constructed fill can also jeopardize structures elevated on fill.

MODEL LANGUAGE:
There are many variations and combinations of standards that can be used for fill. The model language below incorporates standards for quality, stability, and compaction.

Add to Use and Development Standards for Flood Hazard Reduction:

**Fill**
The following standards apply to all fill activities in special flood hazard areas:

- **A.** Fill sites, upon which structures will be constructed or placed, must be compacted to 95 percent of the maximum density obtainable with the Standard Proctor Test method or an acceptable equivalent method,
- **B.** Fill slopes shall not be steeper than one foot vertical to two feet horizontal,
- **C.** Adequate protection against erosion and scour is provided for fill slopes. When expected velocities during the occurrence of the base flood are greater than five feet per second arming with stone or rock protection shall be provided. When expected velocities during the base flood are five feet per second or less protection shall be provided by covering them with vegetative cover.
- **D.** Fill shall be composed of clean granular or earthen material.

OBJECTIVE 2:
To ensure structures built in areas removed from the floodplain via Letters of Map Revision Based on Fill (LOMR-F) are built “reasonably safe from flooding.”

MODEL LANGUAGE:
Add the following provisions to the residential and non-residential development requirements for new construction or substantial improvement:

In any area that has been removed from the floodplain via a Letter of Map Revision Based on Fill, any existing or new structure, addition, or substantial improvement must meet the required elevation freeboard requirements.

VII. FLOODWAY RISE

OBJECTIVE:
To delineate a larger area within the 1%-annual-chance floodplain for flood flow conveyance and to restrict future encroachments that could increase flood levels.

RATIONALE:
Communities with flood studies based on FEMA’s standard floodway encroachment typically see more frequent and more severe flood events because those standards allow the carrying
capacity to be reduced by pinching in the floodway until flood levels raise one foot, thus encroaching the allowable development area into the natural floodway. Base flood elevations and flood insurance premiums do not account for these increases, leaving communities unprotected during the base flood event, and property owners uninsured or under-insured.

MODEL LANGUAGE:

Add the following provisions to the floodway requirements:

*The allowable floodway rise is that level in the community flood study. For new studies, floodway encroachment analyses shall be performed using a ___ foot surcharge to be determined by the community where practicable. The ASFPM generally recommends an allowable floodway rise of no more than 0.5 foot and as little as 0.1 feet where vulnerable or critical development exists.*

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VIII. FOUNDATION DESIGN

**OBJECTIVE:**
To ensure proper design and construction of building foundations to protect building structural integrity against the effects of buoyancy, uplift, debris impacts, and other flood forces.

**RATIONALE:**
ASCE-24 provides a standard of practice for flood resistant design and construction in flood-prone areas.

**MODEL LANGUAGE:**
Add the following sentence (bolded) to the Residential Construction section:

*New construction and substantial improvement of any residential structure, including manufactured homes, shall have the lowest floor, including basement, elevated to or above the base flood elevation plus two feet of freeboard. Support structures and other foundation members shall be certified by a registered professional engineer or architect as designed in accordance with ASCE 24, Flood Resistant Design and Construction, or shall be constructed with designs meeting this standard.*

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IX. FUTURE CONDITIONS HYDROLOGIC MAPPING

**OBJECTIVE:**
To protect property against impacts of increased flood heights due to anticipated future development anywhere in the watershed, especially in rapidly developing areas.

**RATIONALE:**
In many cases, flood studies reflect current conditions at best, and more likely past conditions since the studies often rely on old data. As watersheds are developed, future flood heights are likely to increase. The flood risk criteria used to site and design a project should rely on
conditions the location is likely to experience during the project’s lifetime, not past or current conditions.

MODEL LANGUAGE:
Communities that are experiencing rapid urban and suburban growth and development should require that all new construction and substantial improvement have the lowest floor elevated to or above the future conditions 1%-annual-chance (base) flood level, ideally with the freeboard and other higher standards recommended in this document. We recommend the following three regulations:

(1) Add the following definition:

_Future Conditions Flood Hazard Area_ – Also known as area of future conditions flood hazard, the land area that would be inundated by the one-percent-annual-chance flood based on future conditions hydrology.

(2) Add the following sentence to the “special flood hazard area” definition:

Any area outside the one-percent-annual-chance flood hazard area identified by FEMA and designated as Future Conditions Flood Hazard Area on FEMA’s Flood Insurance Rate Map shall also be considered special flood hazard areas.

(3) Require that all map revisions and watershed studies include analyses based on future conditions associated with anticipated watershed growth and land-use and land-cover changes. These future condition analyses shall be included on community floodplain maps and will serve as the basis for this regulation.

X. MATERIALS STORAGE

OBJECTIVE:
To protect the community against flood damage from materials that may block flood flows or which become buoyant, flammable, explosive, or cause other environmental health issues in floods.

RATIONALE:
Storage of materials is often difficult to regulate since many areas do not require building permits for storage. Stored materials can become waterborne debris during floods, endangering adjacent properties, and creating potential debris blockages where bridges or culverts exist.

MODEL LANGUAGE:
(1) Add the following to the Prohibited Uses section:

_A. Storage or processing of materials that are hazardous, flammable, or explosive in the identified special flood hazard area._
B. Storage of material or equipment that, in time of flooding, could become buoyant and pose an obstruction to flow in identified floodway areas.

(2) Add the following to the Storage of Materials section:

Storage of material or equipment not otherwise prohibited shall be firmly anchored to prevent flotation.

XI. SETBACKS

OBJECTIVE:
To provide a limited use/development set aside area along a stream for flood damage prevention, resource protection, floodwater storage, water quality, pollutant/sediment removal, and natural stream function.

RATIONALE:
Most floodplain regulations protect lands adjacent to streams with property protection and flooding conditions in mind. Floodplains provide a wide range of natural and beneficial functions, and many of these resource protection functions can only be achieved with setbacks that preserve a riparian corridor adjacent to streams. Significant CRS credit is available for this activity, if it results in floodplain open space.

MODEL LANGUAGE:
Specific model language has not been developed due to the technical and planning information needed to establish a setback for a given watercourse. The Center for Watershed Protection (www.cwp.org) has developed some excellent materials about setbacks and has sample ordinances that can be downloaded from the internet.

XII. STORMWATER MANAGEMENT

OBJECTIVE:
To prevent increased flood flows and limit increased runoff from a proposed development to pre-development conditions, and to maintain floodplains and stream channels by reducing erosion and sedimentation from construction activities in flood hazard areas.

RATIONALE:
One of the most effective ways to prevent flooding problems from getting worse over time is to limit the changes in watershed hydrology which increase flows. Probably the single most effective way to accomplish this is through storm water regulations which limit increases in runoff from new development. Significant CRS credit is available for this activity.
MODEL LANGUAGE:
Communities should adopt comprehensive stormwater management regulations which address water quality issues associated with development, and address increased runoff quantity by adopting regulations which ensure, at a minimum:

*All subdivision and other development proposals which involve disturbing more than 10000 square feet of land shall include a stormwater management plan which is designed to limit peak runoff from the site to predevelopment levels for the 1, 10, and 100 year rainfall event. These plans shall be designed to limit adverse impacts to downstream channels and floodplains. Single residential lots involving less than 1 acre of land disturbance are not subject to this regulation.*

For an example of comprehensive stormwater management regulations, the State of Delaware’s regulations are here:  

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XIII. SUBDIVISION STANDARDS

OBJECTIVE:
To ensure subdivisions, including infrastructure and lots are created and designed to minimize risk of damage to property and potential loss of life from flooding, and to minimize the disturbance of floodplain riparian zones.

RATIONALE:
Avoidance of floodplains is far preferable to setting standards and allowing building in the floodplain. The cost of typical flood insurance policy is approaching $1000 dollars, and this doesn’t account for public expenses associated with building in the floodplain.

MODEL LANGUAGE:
The following higher standards language should be adopted into the community’s subdivision regulations (if applicable) and/or flood damage reduction regulations:

(1) Modify the section on subdivisions and large scale development to incorporate the bolded text:

*In all areas of special flood hazard where base flood elevation data are not available, the applicant shall provide a hydrologic and hydraulic engineering analysis that generates base flood elevations for all subdivision proposals, and other proposed developments at least 5 acres or 5 lots in size. These studies shall be submitted to FEMA with a request for map revision.*

(2) Add the following to the section for Subdivisions and Large Scale Development:
A. All preliminary plans for platted subdivisions shall identify the flood hazard area and the elevation of the base flood.

B. All final subdivision plats will provide the boundary of the special flood hazard area, the floodway boundary, and base flood elevations.

C. In platted subdivisions, all proposed lots or parcels that will be future building sites shall have a minimum buildable area outside the natural (non-filled) 1% chance annual floodplain. The buildable area shall be large enough to accommodate any primary structure and associated structures such as sheds, barns, swimming pools, detached garages, on-site sewage disposal systems, and water supply wells, if applicable.

D. Approval shall not be given for streets within a subdivision, which would be subject to flooding in the base flood. All street surfaces must be located at or above the base flood elevation.

XIV. USE RESTRICTIONS

OBJECTIVE:
To restrict or prohibit uses of the floodplain which are dangerous to health, safety or property in times of flood, or which cause excessive increases in flood stages or velocities.

RATIONALE:
Avoidance of floodplains is far preferable to setting standards and allowing building in the floodplain. For many types of critical facilities, the tolerance for even minimal flood risk is extremely low, and complete avoidance of the floodplain should be the standard.

MODEL LANGUAGE:
Add the following to the Prohibited Uses section:

A. New construction of any residential or nonresidential structures in floodway areas.

B. Storage or processing of hazardous, flammable, or explosive materials in special flood hazard areas.

C. Critical development in special flood hazard areas. (Note: Must also adopt the critical development definition – see critical development higher standard).

D. The use of nonconforming structures shall not be changed from a non-residential structure to a residential structure or a mixed-use structure, or increase the residential use area of a mixed-use structure.
E. The use of any structure shall not be changed to a critical facility, where such a change in use will render the new critical facility in violation of Section IV - Critical Development Protection.

XV. REGULATING AREAS NOT MAPPED ON FIRM

OBJECTIVE:
To provide a means for a community to regulate development in areas at risk to flooding that have not been mapped on FEMA’s FIRMs.

RATIONALE:
At best, most flood insurance studies do not map floodplains in watersheds with drainage areas, of less than one square mile, or in areas with poor drainage not associated with flooding sources. In other areas, some larger watersheds may not have been mapped. Estimates are that nationally, over 1/3 of flood damage occurs outside of mapped floodplains.

MODEL LANGUAGE:
(1) Add the following sentence to the “special flood hazard area” definition:

Any area outside the FEMA studied areas lying along blue line streams as shown on the United States Department of the Interior Geological Survey (hereafter referred to as “USGS”) quadrants of which [community name] is contained and/or areas with flood prone soils which are contiguous to blue line streams as shown on the [community name] Flood Prone Soils Map shall also be considered special flood hazard areas.

[Note – in determining the extent of land “contiguous” to blue line streams, communities may elect to establish a buffer defined by width, land elevation, historical flooding, or other data].

(2) Add the following references to the flood hazard data adopted in Basis for Establishing the Areas of Special Flood Hazard:

A. USGS quadrants in which [community name] is contained;

XVI. ELEVATION OF ALL ADDITIONS

OBJECTIVE:
To protect new horizontal additions (increase in building footprint) from flood damage.

RATIONALE:
Building an addition below flood level is essentially expanding a non-conforming use – a practice that has been prohibited in many contexts.
MODEL LANGUAGE:
Add the following provisions to the residential and non-residential development requirements:

*All new horizontal additions must have the lowest floor and all HVAC elevated to the regulatory base flood elevation.*

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XVII. COASTAL SITING

OBJECTIVE:
To provide greater protection to coastal resources and structures that would be at risk of experiencing damage from wave action (V Zones).

RATIONALE:
Coastal flood risk increases dramatically with proximity to oceans and bays. While the NFIP has no siting requirements for V-Zones, locating new construction landward of frontal sand dunes and erosion prone lands provides tremendous protection.

MODEL LANGUAGE:
Add the following provisions to the general requirements for development in V Zones:

*All new structures shall be located on the lot so as to minimize exposure to coastal hazards and shoreline erosion. Structures should be located outside of the V-Zone, to the greatest extent possible. Building setback requirements should consider predicted future erosion rates, or historical erosion rates.*

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XVIII. DUNE PROTECTION

OBJECTIVE:
To provide greater protection to sand dunes and their flood mitigation qualities.
The community in the bottom photograph required coastal construction behind primary frontal sand dunes. The top photo shows adjacent community with no dune setback requirements.
RATIONALE:
Sand dunes act as flood protection barriers along shorelines, and absorb wave energy before it causes damage to buildings. Land altering activities can destabilize sand dunes, and reduce the ability of the dune to absorb wave energy.

MODEL LANGUAGE:
Add the following provisions to the general requirements for development in V Zones:

Retaining walls, landscaping, dune crossovers and other non-essential accessory structures shall be designed and located to minimize impacts to sand dunes. Primary frontal dunes shall not be altered unless a qualified engineer demonstrates and certifies that flood risk will not be increased to the subject, or other, properties. Activities which reduce the volume of sand on the dunes or beach can generally be presumed to increase flood risk to landward locations. Adding sand volume to the dune or beach can generally be presumed to not increase flood risk.

XIX. COASTAL CONSTRUCTION

OBJECTIVE:
To provide a greater factor of protection to structures built in V Zones.

RATIONALE:
Because of the extreme potential for damage from wave energy and high velocity flows and debris associated with coastal flooding, higher construction standards are essential. Breakaway enclosures are a compromise strategy which allow coastal property owners ground level improvements, but maintain structural integrity. ANY breakaway walls will create debris problems and should be kept to a minimum. 300 square feet is chosen to permit the parking of two vehicles.

MODEL LANGUAGE:
Add the following provisions to the residential and non-residential development requirements for V Zone construction:

A. New and substantially improved structures shall have the bottom of the lowest horizontal structural member elevated two or more feet above the base flood elevation.

B. Enclosures below the lowest floor of elevated buildings shall be usable solely for parking, access, and limited storage. These enclosures shall be less than 300 square feet in area, and shall be designed and constructed with breakaway walls which minimize the amount and impact of debris and adverse effects on adjacent properties.

C. Breakaway walls for enclosures below the lowest floor shall be designed to meet building code wind requirements. Such enclosures may be used only for limited storage, parking and access and shall be designed to minimize adverse debris impacts to adjacent properties. Where enclosures are used as access ways to elevated buildings,
a secure door located at the elevated floor level must separate the enclosed area from the elevated building.

D. Detached accessory structures such as sheds or garages shall be prohibited in V-Zones.

XX. COASTAL A-ZONE

OBJECTIVE:
To better protect structures in coastal areas where storm-induced velocity wave actions are unknown.

RATIONALE:
Flooding with wave heights of as little as 1.5 feet can transmit significant energy loads to buildings or other obstructions. A reasonable amount of protection can be provided to development in these A-Zone areas with the potential for 1.5 feet or greater by adopting V-Zone standards in these areas.

MODEL LANGUAGE:
Add the following provisions to the residential and non-residential development requirements for Coastal A Zone construction:

In areas which have been identified as subject to limited wave action (between 1.5 and 3 feet) and designated as a Coastal A-Zone, new and substantially improved structures shall comply with all of the V-Zone provisions of this ordinance. Elevation requirements should refer to the lowest horizontal structural member of the lowest floor.