

# RECOMMENDED ADDITIONAL STANDARDS

The following additional standards are recommended by the Missouri State Emergency Management Agency's Floodplain Management Section. While these standards may be more stringent than the minimum standards of the National Flood Insurance Program (NFIP), they can reduce the potential for significant flood damages in the future and in some cases lead to lower flood insurance rates for local residents.

## Table of Contents

1) Freeboard	Page 2
a) Zone A/AE/AO/AH	Page 2
b) Zone X (Shaded)	Page 2
c) Zone X (Unshaded)	Page 2
2) Fill Standards	Page 2-3
3) Compensatory Storage	Page 3
4) Letter of Map Revision Based on Fill (LOMR-F) Standards	Page 3
5) Setbacks in Riverine Floodplains Standards	Page 4
6) Floodway Rise	Page 4
7) Hazardous Materials	Page 4
8) Critical Facilities	Page 4-5
9) Accessory Structures	Page 5-6
10) Agricultural Structures	Page 6-8
11) Historic Structures	Page 8
12) Temporary Structure	Page 8-10
13) Non-Conforming Use	Page 10
14) Cumulative Improvement	Page 10
15) Mechanical and HVAC equipment servicing the building	Page 11
16) Access (Ingress/ Egress)	Page 11
17) Stormwater Management Standards	Page 11
18) Subdivision Development Standards	Page 12
19) Future Conditions of Hydrologic Mapping	Page 12-13

## - Freeboard

A community may choose to adopt a higher standard for Freeboard.  
One (1) Foot through Four (4) Feet is recommended.

- Zone A/AE/AO/AH

In Article 4 Sections B.1.a, B.1.b, C.2.d and C.3.a change the number from “(a minimum of One (1) Foot) above the base flood elevation.” to “two (2) feet above” in those sections in order to revise the freeboard standard. Two feet is an example and a community may choose any number higher than one.

- Zone X (Shaded)

**If the standards for Shaded Zone- X are adopted, the following must be included in specific requirements for Residential Structures and Non-Residential structures.**

Residential and Non-Residential Structures in areas mapped as Zone X (shaded) on the community Flood Insurance Rate Map (FIRM).

Where flood elevations are available, new construction and substantial improvement of any structure, including manufactured homes, shall have the lowest floor, including basement, elevated (1, 2, or 3) feet above the elevation of the flood hazard elevation.

- Zone X (Unshaded)

**If the standards for Unshaded Zone- X are adopted, the following must be included the in specific requirements for Residential Structures and Non-Residential structures.**

This document does not recommend freeboard in Zone X (unshaded) as these areas are determined to be outside any area with a predicted likelihood of flooding. However, these areas are not immune from flooding, as a flood is any general and temporary condition of partial or complete inundation of normally dry land areas. Flood insurance is available for any property in a community that participates in the NFIP, whether the property is in a mapped flood hazard area, or not.

**To adopt standards for RESIDENTIAL FLOODPROOFED BASEMENTS contact the Floodplain Management Section of the Missouri State Emergency Management Agency. Communities must be preapproved for a basement floodproofing program by FEMA. Sample ordinance language will be provided to communities that meet the program requirements.**

## - Fill Standards

**If the standards for Fill Standards are adopted, the following must be included in Article 4, Section A of this ordinance.**

#. *Fill Standards*

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 armoring 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.

**- Compensatory Storage**

**If the standards for Compensatory Storage are adopted, the following must be included in Article 4, Section A of this ordinance.**

*#. Compensatory Storage Required for Fill*

- a. Fill within the special flood hazard area shall result in no net loss of natural floodplain storage, or increase in water surface elevations during the base flood. 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.

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*

**- Letter of Map Revision Based on Fill (LOMR-F) Standards**

**If the standards for Letter of Map Revision Based on Fill (LOMR-F) are adopted, the following must be included in Article 4, Section A of this ordinance.**

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 of the underlying flood hazard elevation.*

## **- Setbacks in Riverine Floodplains Standards**

**If the standards for Setbacks in Riverine Floodplain Standards are adopted, the following must be included in Article 4, Section A of this ordinance.**

### *#. Setbacks in Riverine Floodplains*

Proposed development adjacent to riverine floodplains shall be set back (50', 100', 200'...) from the floodway boundary or from the centerline of the stream if the floodway has not been delineated.

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](http://www.cwp.org)) has developed some excellent materials about setbacks and has sample ordinances that can be downloaded from the internet.

## **- Floodway Rise**

**If the standards for Floodway Rise are adopted, the following must be included in Article 4, Section A of this ordinance.**

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 – removed). (The ASFPM recommends an allowable floodway rise of – removed) no more than 0.5 foot surcharge, and as little as 0.1 feet where vulnerable or critical development exists as well as in watersheds that are not fully developed.

## **- Hazardous Materials**

**If the standards HAZARDOUS MATERIALS for are adopted, the following must be included in Article 4, Section A of the ordinance.**

### *#. Hazardous Materials*

- a. All hazardous material storage and handling sites shall be located out of the special flood hazard area.

## **- Critical Facilities**

**If the standards for CRITICAL FACILITIES are adopted, the following must be included in Article 4, Section A of the ordinance.**

### *#. Critical Facilities*

- a. All new or substantially improved critical nonresidential facilities including, but not limited, to governmental buildings, police stations, fire stations, hospitals, orphanages, penal institutions, communication centers, water and sewer pumping stations, water and sewer treatment facilities, transportation maintenance facilities, places of public assembly, emergency aviation facilities, and schools shall be elevated above the 500-year flood level or together with attendant utility and sanitary facilities, be floodproofed so

that below the 500-year flood level the structure is water tight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and the effects of buoyancy. A registered professional engineer or architect shall certify that the standards of this subsection are satisfied. Such certification shall be provided to the Floodplain Administrator as set forth in the National Flood Insurance Program (NFIP) regulations.

- b. All critical facilities shall have access routes that are above the elevation of the 500-year flood.
- c. No Critical facilities shall be constructed in any designated floodway.

## **- Accessory Structures**

**If the standards for ACCESSORY STRUCTURES are adopted, the following must be included in this ordinance as specified.**

**The following language must be included in Article 4, Section A of this ordinance.**

### *#. Accessory Structures*

Structures used solely for parking and limited storage purposes, not attached to any other structure on the site, of limited investment value, and not larger than 400 square feet, may be constructed at-grade and wet-floodproofed provided there is no human habitation or occupancy of the structure; the structure is of single-wall design; the accessory structure meets the following floodplain management requirements; and a floodplain development permit has been issued. Wet-floodproofing is only allowed for small low-cost structures.

**The following must also be included in Article 5, Section G if standards for ACCESSORY STRUCTURES are adopted.**

### **SECTION #: CONDITIONS FOR APPROVING VARIANCES OF ACCESSORY STRUCTURES**

Any permit granted for an accessory structure shall be decided individually based on a case by case analysis of the building's unique circumstances. Permits shall meet the following conditions.

In order to minimize flood damages during the one percent annual chance flood event, also referred to as the 100-year flood and the threat to public health and safety, the following conditions shall be required for any permit issued for accessory structures that are constructed at-grade and wet-floodproofed:

1. Use of the accessory structures must be solely for parking and limited storage purposes in any special flood hazard area as identified on the community's Flood Insurance Rate Map (FIRM).
2. For any new or substantially damaged accessory structures, the exterior and interior building components and elements (i.e., foundation, wall framing, exterior and interior finishes, flooring, etc.) below the base flood elevation, must be built with flood-resistant materials in accordance with Article 4, Section A (4)(b) of this ordinance.
3. The accessory structures must be adequately anchored to prevent flotation, collapse, or lateral movement of the structure in accordance with Article 4, Section A (4)(a) of this ordinance. All

of the building's structural components must be capable of resisting specific flood-related forces including hydrostatic, buoyancy, and hydrodynamic and debris impact forces.

4. Any mechanical, electrical, or other utility equipment must be located above the base flood elevation or floodproofed so that they are contained within a watertight, floodproofed enclosure that is capable of resisting damage during flood conditions in accordance with Article 4, Section A (4)(d) of this ordinance.
5. The accessory structures must meet all NFIP opening requirements. The NFIP requires that enclosure or foundation walls, subject to the one percent annual chance flood event, also referred to as the 100-year flood, contain openings that will permit the automatic entry and exit of flood waters in accordance with Article 4, Section B (1)(c) of this ordinance.
6. The accessory structures must comply with the floodplain management floodway encroachment provisions of Article 4, Section D (2) of this ordinance. No permits may be issued for accessory structures within any designated floodway, if any increase in flood levels would result during the 100-year flood.
7. Equipment, machinery, or other contents must be protected from any flood damage.
8. No disaster relief assistance under any program administered by any Federal agency shall be paid for any repair or restoration costs of the accessory structures.
9. Wet-floodproofing construction techniques must be reviewed and approved by the community. The community may request approval by a registered professional engineer or architect prior to the issuance of any floodplain development permit for construction. Cost for any required professional certification to be paid by the developer.

## **- Agricultural Structures**

**If the standards for AGRICULTURAL STRUCTURES are adopted, the following must be included in this ordinance as specified.**

**The following language must be included in Article 4, Section A of this ordinance.**

### *#. Agricultural Structures*

Structures used solely for agricultural purposes in connection with the production, harvesting, storage, drying, or raising of agricultural commodities, including the raising of livestock, may be constructed at-grade and wet-floodproofed provided there is no human habitation or occupancy of the structure; the structure is of single-wall design; there is no permanent retail, wholesale, or manufacturing use included in the structure; the structure meets the following floodplain management requirements; and a floodplain development permit has been issued.

**The following must also be included in Article 5, Section F if standards for AGRICULTURAL STRUCTURES are adopted.**

## SECTION #: CONDITIONS FOR APPROVING VARIANCES OF AGRICULTURAL STRUCTURES

Any permit granted for an agricultural structure shall be decided individually based on a case by case analysis of the building's unique circumstances.

In order to minimize flood damages during the 100-year flood and the threat to public health and safety, the following conditions shall be included for any permit issued for agricultural structures that are constructed at-grade and wet-floodproofed:

1. All proposed agricultural structures shall demonstrate that no other alternate location outside of the special flood hazard area exists for the agricultural structure. Residential structures, such as farm houses, cannot be considered agricultural structures.
2. Use of the structures must be limited to agricultural purposes in any special flood hazard area only as identified on the community's Flood Insurance Rate Map (FIRM).
3. For any new or substantially damaged agricultural structures, the exterior and interior building components and elements (i.e., foundation, wall framing, exterior and interior finishes, flooring, etc.) below the base flood elevation, must be built with flood-resistant materials in accordance with Article 4, Section A (4)(b) of this ordinance.
4. The agricultural structures must be adequately anchored to prevent flotation, collapse, or lateral movement of the structures in accordance with Article 4, Section A (4)(a) of this ordinance. All of the building's structural components must be capable of resisting specific flood-related forces including hydrostatic, buoyancy, and hydrodynamic and debris impact forces.
5. Any mechanical, electrical, or other utility equipment must be located ***(a minimum of One (1) Foot)*** above the base flood elevation, or floodproofed so that they are contained within a watertight, floodproofed enclosure that is capable of resisting damage during flood conditions in accordance with Article 4, Section A (4)(d) of this ordinance. The elevation shall be certified by a licensed land surveyor or professional engineer.
6. The agricultural structures must meet all National Flood Insurance Program (NFIP) opening requirements. The NFIP requires that enclosure or foundation walls, subject to the one percent annual chance flood event, also referred to as the 100-year flood, contain openings that will permit the automatic entry and exit of flood waters in accordance with Article 4, Section B (1)(c) of this ordinance.
7. The agricultural structures must comply with the floodplain management floodway encroachment provisions of Article 4, Section D (2) of this ordinance. No permits may be issued for agricultural structures within any designated floodway, if any increase in flood levels would result during the one percent annual chance flood event, also referred to as the 100-year flood.
8. Major equipment, machinery, or other contents must be protected from any flood damage.
9. No disaster relief assistance under any program administered by any Federal agency shall be paid for any repair or restoration costs of the agricultural structures.

10. Wet-floodproofing construction techniques must be reviewed and approved by the community. The community may request approval by a registered professional engineer or architect prior to the issuance of any floodplain development permit for construction. Cost for any required professional certification to be paid by the developer.

### **- Historic Structures**

**If the standards for HISTORIC STRUCTURES are adopted, the following must be included in Article 4, Section A of this ordinance.**

#. *Historic Structures*

- a. Variances may be issues for the repair or rehabilitation of historic structures upon a determination that the proposed repair or rehabilitation will not preclude the structure's continued designation as a historic structure and the variance is the minimum necessary to preserve the historic character and design of the structure.

### **- Temporary Structure**

**If the standards for TEMPORARY STRUCTURES are adopted, the following must be included in this ordinance as specified.**

**The following must be included in Article 4, Section A of this ordinance.**

#. *Temporary Structure*

A Temporary Structure is strictly permitted only by special use permit issued by the governing body of the community. Any application for a special use permit to allow a temporary structures will reviewed for compliance with all existing ordinances and codes, including the special use permit regulations

**The following language must be included in Article 5 of this ordinance.**

#### **SECTION #. CONDITIONS FOR APPROVING TEMPORARY STRUCTURES**

Any permit granted for a temporary structure shall be decided individually based on a case by case analysis of the building's unique circumstances.

1. A temporary structure may be considered for location within the one percent annual chance flood event, also referred to as the 100-year floodplain only when all of the following criteria are met:
  - a. Use of the temporary structure is unique to the land to be developed and cannot be located outside of the floodplain nor meet the NFIP design standards;
  - b. Denial of the temporary floodplain development permit will create an undue hardship on the property owner;
  - c. Community has adopted up-to-date NFIP and building regulations to direct placement and removal of the temporary structure; and,



- d. Community has sufficient staff to monitor the placement, use, and removal of the temporary structure throughout the duration of the permit.
2. Once all of the above conditions are met, an application for a temporary floodplain development permit must be made to the (**GOVERNING BODY**). The (**GOVERNING BODY**) shall consider all applications for temporary floodplain development permits for a temporary structure based on the following criteria:
    - a. The placement of any temporary structure within the special flood hazard areas as shown on the community's adopted FEMA/NFIP map shall require an approved temporary floodplain development permit. The temporary floodplain development permit shall be valid for a period not to exceed 180 days.
    - b. Temporary floodplain development permit applications, for a temporary structure to be located in special flood hazard areas, shall conform to the standard public hearing process prior to any community action on the permit request.
    - c. An emergency plan for the removal of the temporary structure that includes specific removal criteria and time frames from the agency or firm responsible for providing the manpower, equipment, and the relocation and disconnection of all utilities shall be required as part of the temporary floodplain development permit application for the placement of any temporary structure.
    - d. On or before the expiration of the end of the 180 day permit period, the temporary structure shall be removed from the site. All utilities, including water, sewer, communication, and electrical services shall be disconnected.
    - e. To ensure the continuous mobility of the temporary structure for the duration of the permit, the temporary structure shall retain its wheels and tires, licenses, and towing appurtenance on the structures at all times.
    - f. Under emergency flooding conditions, the temporary structure shall be removed immediately or as directed by the community and as specified in the emergency removal plan.
    - g. Location of any temporary structure within the regulatory floodway requires the provision of a "no-rise" certificate by a registered professional engineer.
    - h. Violation of or non-compliance with any of the stated conditions of the temporary floodplain development permit during the term thereof, shall make the permit subject to revocation by resolution of the governing body of the community. Issuance of permit revocation notice shall be made to the landowner, the occupant of the land, and to the general public.
    - i. Any deviation from the approved site plan shall be deemed a violation of the temporary floodplain development permit approval and the uses allowed shall automatically be revoked. The subsequent use of the land shall be as it was prior to the permit approval. In event of any violation, all permitted special uses shall be deemed a violation of this

ordinance and shall be illegal, non-conforming uses and shall be summarily removed and abated.

- j. If the temporary structure is to be returned to its previously occupied site, the process for issuing a temporary floodplain development permit must be repeated in full. Any subsequent permit shall be valid for 180 days only.

**The following definition must be included in Article 8 of this ordinance:**

**"Temporary Structure"** means a structure permitted in a district for a period not to exceed 180 days and is required to be removed upon the expiration of the permit period. Temporary structures may include recreational vehicles, temporary construction offices, or temporary business facilities used until permanent facilities can be constructed, **but at no time shall it include manufactured homes used as residences.**

**- Non-Conforming Use**

**If the standards for NONCONFORMING USE are adopted, the following must be included in Article 4, Section A of this ordinance.**

*#. Nonconforming Use*

A structure, or the use of a structure or premises that was lawful before the passage or amendment of the ordinance, but which is not in conformity with the provisions of this ordinance, may be continued subject to the following conditions:

- a. If such structure, use, or utility service is discontinued for \_\_\_\_\_ consecutive months, any future use of the building shall conform to this ordinance.
- b. If any nonconforming use or structure is destroyed by any means, including flood, it shall not be reconstructed if the cost is more than 50 percent of the pre-damaged market value of the structure. This limitation does not include the cost of any alteration to comply with existing state or local health, sanitary, building, safety codes, regulations or the cost of any alteration of a structure listed on the National Register of Historic Places, the State Inventory of Historic Places, or local inventory of historic places upon determination.

**- Cumulative Improvement**

**If the standards for CUMULATIVE IMPROVEMENT are adopted, the following must be included in Article 4, Section A of this ordinance.**

*#. Cumulative Improvement*

- a. A structure may be improved (remodeled or enlarged) without conforming to current requirements for elevation so long as the cumulative value of all work done within the last \_\_\_\_ calendar years does not exceed fifty (50) percent of the structure's current market value. If the cumulative value of the improvement exceeds fifty (50) percent of the structure's current market value, the structure must be brought into compliance with Article 4, Section B(1) which requires elevation of residential structures to one (1) foot above the base flood elevation or the elevation/floodproofing of non-residential structures to one (1) foot above the base flood elevation.

## **- Mechanical and HVAC equipment servicing the building**

**If the standards for MECHANICAL AND HVAC EQUIPMENT SERVICING THE BUILDING are adopted, the following must be included in this ordinance as specified.**

**The following language must be included in Article 4, Sections B.1.a, B.1.b., C.2.d and C.3.a. of this ordinance.**

Mechanical and HVAC equipment servicing the building must be elevated or flood protected to same level as the lowest floor.

*Example for Section B.1.a.: New construction or substantial-improvement of any residential structures, including manufactured homes, shall have the lowest floor, including basement, elevated to **(a minimum of One (1) Foot)** above the base flood elevation. **Mechanical and HVAC equipment servicing the building must be elevated or flood protected to same level as the lowest floor.** The elevation of the lowest floor shall be certified by a Missouri licensed land surveyor, professional engineer, or architect.*

## **- Access (Ingress/ Egress)**

**If the standards for Access (Ingress-Egress) are adopted, the following must be included in Article 4, Section A of this ordinance.**

Add to specific requirements for Subdivisions and Planned Developments:

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 dry land access.

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 dry land access.

## **- Stormwater Management Standards**

**If the standards for Stormwater are adopted, the following must be included in Article 4, Section A of this ordinance.**

Communities should adopt comprehensive storm water management regulations which address water quality issues associated with development, and address increased runoff quantity by adopting regulations which ensure, at a minimum:

#. *Stormwater Management Standards*

- a. All subdivision and other development proposals which (involve disturbing more than 10000 square feet of land – removed) disturb one acre of land or more shall include a storm water 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.

## Subdivision Development Standards

If the standards for Subdivision Standards are adopted, the following must be included in Article 4, Section A of this ordinance.

The following higher standards language should be adopted into the community's subdivision regulations (if applicable) and/or flood damage reduction regulations: Modify the section on subdivisions and Planned Development to incorporate the bolded text:

### #. *Subdivision Standards*

- a. **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 and floodway boundaries and future conditions flood elevations for all subdivision proposals, and other proposed developments at least 5 acres or 50 lots in size (optional language: greater than 1, 2, 5 acres).**
- b. **These studies shall be submitted to FEMA as a request for map revision and the record plan and all permitting documents shall reference the revised floodplain and base flood elevations accepted by FEMA and the community.**

Add the following to the section for Subdivisions and Planned Development:

- a. All preliminary plans for platted subdivisions shall identify the flood hazard area and the elevation of the base flood as well as future conditions flood elevations.
- b. All final subdivision plats will provide the boundary of the special flood hazard area, the floodway boundary, and base flood elevations, as well as future conditions 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.

\*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.

## - **Future Conditions of Hydrologic Mapping**

If the standards for Future Conditions of Hydrologic Mapping are adopted, the following must be included in Article 4, Section A of this ordinance.

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 flood level, ideally with the freeboard and other higher standards recommended in this document.

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 flood based on future conditions hydrology.

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

Any areas outside the 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.

Add specific requirement to Subdivisions and Planned Developments:

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.