

SUMMARY OF REQUIREMENTS FOR BUILDING IN SPECIAL FLOOD HAZARD AREAS (SFHA)

INTRODUCTION

This document was prepared by the City of Los Angeles, Bureau of Engineering, National Flood Insurance Coordinator. Its purpose is to provide guidance to Public and Private project managers in the compliance of the City's Specific Plan for the Management of Flood Hazards (Ordinance 172081).

DEFINITIONS

Basement: Any area of the building having its floor subgrade (below ground level) on all sides. The construction of a basement is prohibited in a SFHA.

Base Flood: Any flood having a one percent chance of being equaled or exceeded in any given year.

Coastal High-Hazard Area: Any area subject to high velocity waters including, but not limited to wave wash or tsunami. This area is designated V1-30, V or VE Zones on the Los Angeles Flood Hazard Map (LAFHM).

Flood Insurance Rate Map (FIRM): The official map issued by the Federal Insurance Administrator delineating both the special hazard areas and the risk premium zones for the City of Los Angeles.

Flood-Proofing: Any combination of structural and non-structural additions, changes or adjustments to structures which reduce or eliminate flood-related damage to real estate or improved real property, water and sanitary facilities, structures and their contents.

Floodway: The channel of a river or other major drainage course and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.

Freeboard: A factor of safety in feet above a base flood elevation. Freeboard intends to compensate for the unknown factors that could contribute to flood heights greater than the height calculated for a selected size flood and floodway conditions, such as the hydrological effect of urbanization of the watershed, wave action, and bridge openings.

Highest Adjacent Grade: The highest natural elevation of the ground surface prior to construction next to the proposed walls of a structure.

Large Developments: Developments greater than five acres or fifty lots. Large developments are considered subdivisions by the NFIP Code of Federal Regulations.

Los Angeles Flood Hazard Map (LAFHM): Consists of the following: a) the Flood Insurance Rate Map (FIRM) and Flood Boundary & Floodway Map (FBFM) issued by Federal Emergency Management Agency (FEMA) and b) other maps designated by the City Council.

Lowest Floor: The lowest floor of the lowest enclosed area (including a basement) after construction. An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access or storage, in an area other than a basement area, is not considered a building's lowest floor; provided, that such enclosure is not built so as to render the structure in violation of the applicable non-elevation design requirements by FEMA.

Manufactured Home: A structure, transportable in one or more sections which is built on a permanent chassis and designed to be used with or without a permanent foundation when connected to the required utilities. Recreational vehicles or travel trailers used only for vacations are not considered manufactured homes. The term includes, but is not limited to, the definition of "Manufactured Home" as set forth in the regulations governing the Mobile Home Safety and Construction Standards Program (24 CFR 3282.7(u)). For floodplain management purposes the term "manufactured home" also includes park trailers, travel trailers and other similar vehicles placed on a site for greater than 180 consecutive days.

Special Flood Hazard Area (SFHA): An area having special flood, mudslide (i.e., mudflow) and/or flood-related erosion hazards, and shown on the Flood Insurance Rate Map (FIRM) as Zone A, AO, A1-A30, AE, A99, AH, VO, V1-V30, VE, V, M or E.

Structure: Anything constructed or erected either upon or below the surface of the earth and which is supported directly or indirectly by the earth including manufactured homes.

Substantial (Significant) Improvement: Any repair, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the current valuation or market value of the structure before the "start of construction" of the improvement.

REQUIREMENTS PER CITY ORDINANCE

General

Developer(s) must assure that potential buyers or renters are notified when properties to be bought or rented are located in a Special Flood Hazard Area.

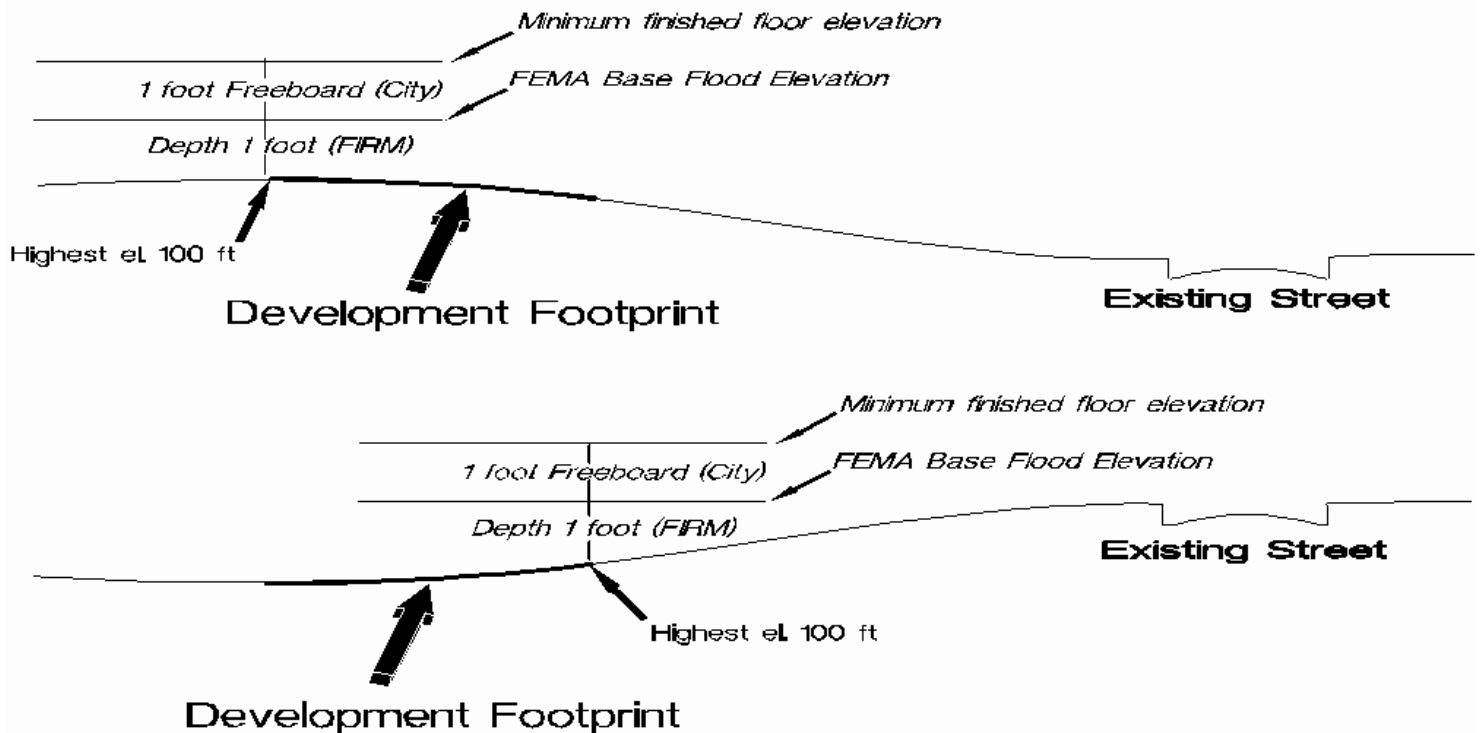
Areas Subject to Ponding

- **Zone AO (Code AO)**

All new construction or substantial improvement, shall have the Lowest Floor, including the basement, elevated above the highest adjacent natural grade on perimeter of building to the height of one foot freeboard plus the Base Flood Depth (BFD) specified in feet on the Flood Insurance Rate Map (FIRM).

Zone AO - Depth 1 foot

Minimum finished floor elevation required by the City = 102 ft



HIGHEST ADJACENT GRADE: *Highest natural grade adjacent to the footprint of the building prior to construction.*

If no depth number is specified on the FIRM, then the Lowest Floor, including the basement, must be elevated two feet plus one foot freeboard to or above the highest adjacent natural grade.

- **Zones AE, AH, and A1-A30 (Codes: AE, AH, A1-A30)**

All new construction or substantial improvement, shall have the Lowest Floor, including basement, elevated to or above the Base Flood Elevation (BFE) specified on the FIRM plus one foot freeboard.

Alluvial Fan

- **Alluvial Fan (Code: AO(AF))**

All new construction and substantial improvement are recommended to elevate on anchored pilings, columns or posts adequately and securely. The lowest horizontal portion of the structural members of the Lowest Floor is elevated to or above BFE / BFD plus one foot freeboard.

Must be armored above and below grade to withstand scour, erosion, and debris impact and to protect the structure's foundation.

Should be oriented parallel to expected flood flow to reduce debris damage, to avoid deflecting flow to adjacent or downstream

property, and to minimize obstruction to flow.

Coastal Areas

o Zone VE and V1-30 (Codes: VE and V1-V30)

The existence and extent of flooding, coastal high hazard and/or flood related erosion must be considered in the planning, siting, design and construction of public and private development. Full considerations must be given to the fact that development in coastal high hazard and/or flood-related erosion areas may create a potential for loss of life and personal injuries, loss to public and private property and exposure to coastal high-hazard and/or flood-related erosion hazards.

Each permit shall have sufficient information to determine whether the proposed project will be safe from hazards or aggravate existing coastal hazards. Each application shall further provide the elevation of the lowest floor.

When the proposed project is found to be in the path of coastal high-hazard, require the project to be relocated or protective measures be taken so as to not aggravate the hazard or shift the hazard to another location.

All new construction and substantial improvement shall be elevated on adequately anchored pilings or columns and securely anchored to such piles or columns so that the lowest portion of the structural members of the lowest floor (excluding the pilings or columns) is elevated to or above the base flood level. A Registered Civil Engineer, Structural Engineer or Architect shall certify that the structure is securely columns in order to withstand velocity waters and hurricane wave wash.

All new construction shall be located landward of the reach of mean high tides.

It is prohibited to use fill for structural support in zone V1-V30, V or VE.

All new construction shall have the space below the Lowest Floor free of obstructions or constructed with breakaway walls. Such enclosed space shall not be used for human habitation and will be usable solely for parking of vehicles, building access, or storage.

The placement of manufactured homes, except in existing manufactured home parks and manufactured home subdivisions, will not be prohibited if they are in compliance with conventional housing standards.

The alteration of sand dunes which would increase potential flood damage shall be prohibited.

Floodways

Floodway (Code: AO(FW))

Floodways shall be maintained in good repair and free of debris by the agency or organization (public or private) responsible for such activity.

No new construction or substantial improvement or other development shall be allowed.

All development existing within floodway at the time of the adoption of Ordinance 154,405 (October 9, 1980) may continue. No grants, privileges or considerations shall be given which prolong the life of the development unless alternative means are provided for the unimpeded discharge of a Base flood.

Facilities in which hazardous substances are stored, manufactured or used are prohibited in a floodway.

The drainage channels adequate to discharge the flood waters or runoff of a base flood be preserved from encroachment in areas which are still substantially undeveloped.

Whenever existing development now occupies floodways, measures must be taken to either; provide flood works sufficient to discharge a base flood, or, encourage relocation of such development outside of areas which must be preserved as floodways as required for the overall safety, health and well-being of the community.

The floodways shall be maintained in good repair and free of debris by the agency or organization (public or private) responsible for such activity.

Requirements for Zone A (Code A) *Undetermined Hazard*

Subdivision's requirements:

All division of land proposals shall include the Base Flood Elevation data, i.e., a detailed study of the flood hazard.

Prevent flood-related damage to subdivision and to existing downstream development, both during construction and subsequently.

For areas involving natural or man-made channels for potential runoff of a Base flood, subdividers shall be required to furnish delineation for floodways, if not already mapped or if changes are proposed to the mapped floodways.

Provisions for alternative vehicular access and escape routes when normal routes are blocked or destroyed by flooding and/or mudflow shall be required whenever possible.

New manufactured home parks shall have an evacuation plan indicating alternate vehicular access and escape routes to be filed with the Emergency Operations Board.

The detailed Base Flood Elevation study should follow FEMA guidelines entitled "Flood Insurance Study - Guidelines and Specifications for Study Contractor" - FEMA 37, March 1993. Once the detailed study is completed, developer must file a Letter of Map Revision application with FEMA to revise the Flood Insurance Rate *Map*

For a **Small Development** of less than five acres or fifty lots:

Must elevate the structures to or above the BFE plus one foot freeboard.

Construction must be reasonably safe from flooding, properly anchored, and will not have a basement (below the BFE).

Developer must obtain available 100-year flood elevation data from any reasonably accurate source for establishing lowest floor elevations or hire an engineer to determine the BFE for the site.

Large Developments:

All division of land proposals shall include the BFE data, i.e., a detailed study of the flood hazard. The detailed BFE study should follow FEMA guidelines entitled "Flood Insurance Study - Guidelines and Specifications for Study Contractor" - FEMA 37, March 1993. Once the detailed study is completed, developer must file a Letter of Map Revision application with FEMA to revise the FIRM.

Prevent flood-related damage to subdivision and to existing downstream development, both during construction and subsequently.

For areas involving natural or man-made channels for potential runoff of a Base flood, subdividers shall be required to furnish delineation for floodways, if not already mapped or if changes are proposed to the mapped floodways.

Provisions for alternative vehicular access and escape routes when normal routes are blocked or destroyed by flooding and/or mudflow shall be required whenever possible.

New manufactured home parks shall have an evacuation plan indicating alternate vehicular access and escape routes to be filed with the Emergency Operations Board.

Public and Private Development

All public and private development is prohibited in areas where flood related hazards would seriously endanger human life, health or property.

When public utilities, public or quasi-public must be located in special hazard areas, they must be constructed in a manner to minimize or eliminate any flood hazards.

Manufactured Homes

The City in approving the location of new manufactured home parks shall require an evacuation plan indicating alternate vehicular access and escape routes to be filed with the Emergency Operations Board.

UNDERSTANDING BUILDING AND SAFETY'S GEO INDICATOR CODE

General

This section explains the meaning of the Geo Indicator section of the Plan Check Information System (PCIS). This code is used to determine the applicability of flood construction requirements for each flood project.

Example 1: A14 D=NO E=22 PI

Flood Hazard Designation: **A14**

Depth: **Not available**

Elevation: **22 feet above sea level**

Property is **Partially In** the flood zone

Example 2: AO D=3 E=NO IN

Flood Hazard Designation: **AO**

Depth: **3 feet above sea level**

Elevation: **Not available**

Property is completely **IN** the flood zone

Example 3: A6 (FW) D=NO E=192 PI

Flood Hazard Designation: **A6** (located in a **Floodway**)

Depth: **Not available**

Elevation: **192 feet above sea level**

Property is **Partly In** the flood zone

Example 4: A D=NO E=NO IN

Flood Hazard Designation: **A**

Depth: **Not available**

Elevation: **Not available**

Property is completely **IN** the flood zone

SUMMARY FEMA GUIDELINES FOR DEVELOPERS

The content on this chapter are excerpts from various FEMA Technical Documents and Federal Regulations. This summary is not intended to serve as a sole guide to design and construct structures in SFHA's. Developers are referred to FEMA Technical documents and to the Federal Regulations as well as the City's Specific Plan of Floodplain Management.

Elevated Foundations

1. Elevation on Fill

This is the only method which will qualify for the Letter Of Map Revision/Amendment. Applicable to Zones A, AO, AE, AH, AR, and A1-A30 with low velocity flooding of less than three feet per second

- o Limited to four feet in height.
- o The fill should be placed in maximum 12-inch lifts, and compacted to 95% of the maximum density obtainable with the Standard Proctor Test Method.
- o Fill slopes should be no steeper than 1.0 foot vertical to 1.5 feet horizontal.
- o Fill should extend a minimum of 15 feet beyond all sides of the structure.

1. Perimeter Wall Foundation

Only for Flood Zones A, AO, AE, AH, and A1-A30 with low velocity flooding of less than three feet per second.

- o Limited to four feet in height.
- o Enclosed areas below the Lowest Floor must have openings to equalize hydrostatic pressure force on exterior walls by allowing for the entry and exit of floodwater.
- o A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding. The bottom of all openings shall be no higher than one foot above grade.
- o Openings may be equipped with screens, louvers, valves, or other automatic coverings.

1. Pile Foundation

- o Only for Flood Zones A, AO, AE, AH, AR, A1-A30 and V with large depths of flooding and high velocities. Particularly well suited for coastal high hazard areas.
- o Must consider the pile embedment method & depth, bracing to resist lateral forces and proper connections such as, foundation to floor beam, floor beam to floor joist, floor joist to wall and wall to roof.

1. Other Elevated Foundation

- o Shear walls, posts and piers foundation can be used to elevate the structure to or above the BFE plus one foot freeboard.

Floodproofing

Not to be used in lieu of elevating a residential structure.

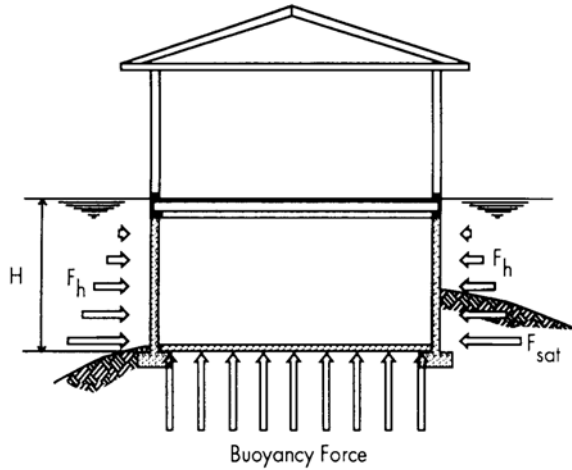
1. Dry Floodproofing - Only for Non-Residential Structures

- o Non-residential construction, new or substantial improvement may be floodproofed below the lowest floor so that the structure is watertight with walls substantially impermeable to the passage of water.

- Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy.
- Be certified by a registered professional engineer or architect that the above standards are satisfied.

1. Wet Floodproofing - Only for the structures in Zones A, AO, AE, AH, AR and A1-30

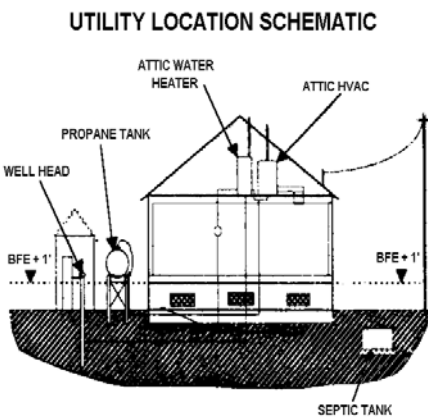
- An enclosed area / attached garage (not a basement - see definition) below the lowest floor may be used only for parking, building access, or limited storage.



- Permanent or contingent measures must be applied to a structure and/or its contents that prevent or provide resistance to damage from flooding by allowing flood waters to enter the structure.
- If accompanied by a variance, Wet Floodproofing may be used for the following: structures functionally dependent on close proximity to water, historic structures, accessory and agricultural structures, and pre-FIRM structures not substantially improved or damaged.
- Flood resistant materials must be used for those areas of a structure below the BFE.

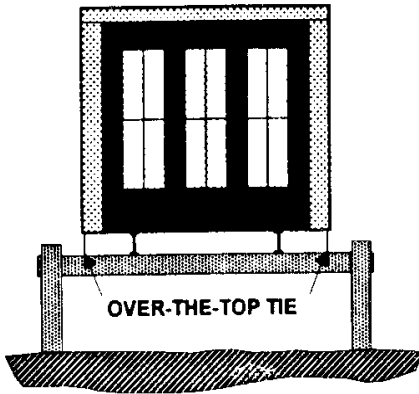
Standards for Utilities and Building Systems

- All new construction and substantial improvement shall be constructed with electrical, HVAC, plumbing and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.
- For subdivisions and manufactured home parks, all public utilities and facilities, such as sewer, gas, electrical, and water systems must be located and constructed to minimize flood damage.
- Electrical, heating, ventilation, plumbing, air conditioning and other service facilities shall be designed so as to prevent water from entering or shall be located above the BFE



Manufactured Homes

- Manufactured homes must also satisfy the requirements applicable for the corresponding SFHA.



- All manufactured homes and additions to manufactured homes shall be anchored to resist flotation, collapse, or lateral movement.
- Over the top and frame ties must be used with anchors set in the ground to resist both vertical and lateral loads.
- Anchoring on Elevated Foundations. Manufactured home must be anchored to the ground using ground anchors or to the elevated foundation.
- Anchoring on Pier Foundations. Pier foundations can have limited resistance to lateral loads; therefore, devices independent of the foundations, such as ground anchors must be used.
- Anchoring on Post or Pile Foundation. Post and pile foundations have much greater resistance to lateral loads, and lateral loads can be transferred directly to the foundation. If the manufactured home is designed for over-the-top and/or frame ties, the ties can be connected directly to the elevated foundation. If the manufactured home is designed for frame ties only, the I-beams can be connected directly to the lateral foundation beams.

LIST OF FEMA TECHNICAL REFERENCE DOCUMENTS

The publications on flood-related subjects are available at no charge from the Federal Insurance Administration / Federal Emergency Management Agency at:

Federal Emergency Management Agency

P.O. Box 70274

Washington, D.C. 20024

Attention: Publications

Please include both the publication number and the name when ordering

References:

1. "Managing Floodplain Development in Approximate Zone A Areas - A Guide for Obtaining and Developing Base (100-Year) Flood Elevations", FEMA 265, July 1995.
2. "Elevated Residential Structure", FEMA-54, March 1984.
3. "Coastal Construction Annual", FEMA-55, February 1986.
4. "Flood Resistant Materials Requirements", FIA-TB-2, April 1993
5. "Non-Residential Floodproofing - Requirements and Certification", FIA-TB-3, April 1993
6. "Below-Grade Parking Requirements", FIA-TB-6, April 1993
7. "Wet Floodproofing Requirements", FIA-TB-7, December 1993
8. "Floodproofing Non-Residential Structures", FEMA 102, May 1986
9. "Design Manual for Retrofitting Floodprone Residential Structures", Chapter 9, FEMA 114, September 1986.
10. "Manufactured Home Installation in Flood Hazard Areas", FEMA 85, September 1985

