



# Quick Guide

**California Department of Water Resources**

Floodplain Management Branch

<https://water.ca.gov/nfip/>





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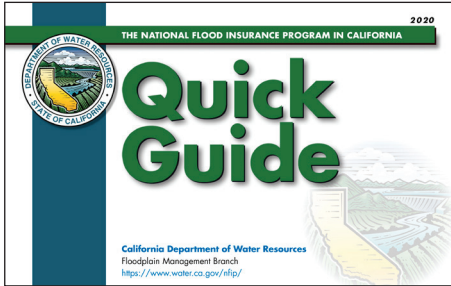
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## About This Guide



This **Quick Guide** helps local officials and citizens understand why and how California communities must manage development in floodplains to protect people and property.

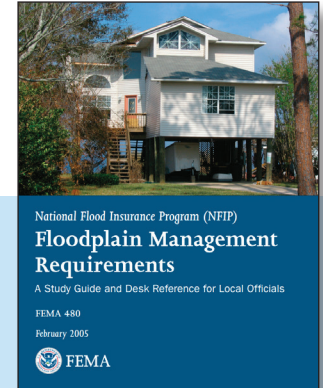
Flood-prone communities enforce the flood provisions in the California Building Standards Code (CCR Title 24) and adopt and enforce floodplain management regulations. In the event of conflict, those codes and regulations and not this Guide, must be followed.

The California Department of Water Resources (DWR), Floodplain Management Branch, coordinates the National Flood Insurance Program in California (<https://water.ca.gov/nfip/>). Contact [DWR\\_NFIP@water.ca.gov](mailto:DWR_NFIP@water.ca.gov) if you have questions.

Prepared by:

**RCQUINN**  
CONSULTING, INC.

For more detail on all aspects of floodplain management, please refer to FEMA 480, *National Flood Insurance Program, Floodplain Management Requirements: A Study Guide and Desk Reference for Local Officials*.



## Why Do We Regulate the Floodplain?

**To protect people and property.** Implementing floodplain management regulations reduces vulnerability to future flood risk. If we know low lying land will flood from time to time, we should make reasonable decisions to help protect our families, homes, and businesses.

**To make sure federal flood insurance is available.** Communities must join the NFIP and administer floodplain management requirements before residents and businesses can purchase federal flood insurance and to be eligible for some types of federal assistance, including flood mitigation grants.

**To save tax dollars.** Every time communities experience flood disasters local budgets are impacted. If we build smart, we'll have fewer problems the next time the water rises. Remember, federal disaster assistance is not available for all floods. Even when the President declares a disaster, communities still must pay a portion of repair and clean-up costs, temporary housing assistance, and evacuation expenses.

**To avoid liability and lawsuits.** If we know an area is mapped as a flood hazard area, and if we know people could be in danger and buildings could be damaged, doesn't it make sense to take reasonable protective steps as our communities develop and redevelop?

Since 1978, federal flood insurance policy holders in California have received over \$600 million in claim payments. Even though that represents many payments, most of the state's flood-prone property owners do not have flood insurance.

## What is the National Flood Insurance Program?

The National Flood Insurance Program (NFIP) was created by Congress in 1968 to protect lives and property and to reduce the financial burden of providing disaster assistance. The NFIP is administered by the Federal Emergency Management Agency (FEMA). Nationwide, over 22,300 communities participate in the NFIP— more than 525 California counties, cities and towns participate.

The NFIP is based on a mutual agreement between the Federal Government and communities. Communities that participate agree to regulate development in mapped flood hazard areas according to certain criteria and standards. The partnership involves:



- **Flood hazard maps.** In partnership with water management districts, communities, and the State, FEMA produces flood maps in accordance with FEMA standards. The maps are used by communities, insurance agents, real estate professionals, and others.
- **Flood insurance.** Property owners and renters in participating communities are eligible to purchase federal flood insurance for buildings and contents.
- **Regulations.** Communities must adopt and enforce minimum floodplain management regulations so that development, including buildings, is undertaken in ways that reduce exposure to flooding.

To learn more about the NFIP, including your potential flood risk and the approximate cost of a flood insurance policy, go to FEMA's FloodSmart website [www.floodsmart.gov](http://www.floodsmart.gov).



## NFIP Community Responsibilities

To participate in the National Flood Insurance Program, communities agree to:

- **Recognize** flood hazards in community planning ([see page 7](#))
- **Adopt and enforce** flood maps and a flood damage prevention ordinance
- **Require** permits for all types of development in the floodplain ([see page 35](#))
- **Assure** that building sites are reasonably safe from flooding
- **Establish** base flood elevations (BFE) where not determined on Flood Insurance Rate Maps (FIRMs)
- **Require** new and substantially improved homes and manufactured homes to be elevated above the BFE
- **Require** non-residential buildings to be elevated above the BFE, or dry floodproofed
- **Determine** if damaged buildings are substantially damaged
- **Conduct** field inspections; cite and remedy violations
- **Require and maintain** surveyed elevation information to document compliance ([see pages 43, 44, and 46](#))
- **Carefully consider** requests for variances
- **Resolve** non-compliance and violations of floodplain management requirements
- **Advise and work** with FEMA and the State when updates to flood maps are needed
- **Maintain** records for review and respond to periodic requests for reports to FEMA

## Flood Insurance: Property Owner's Financial Protection

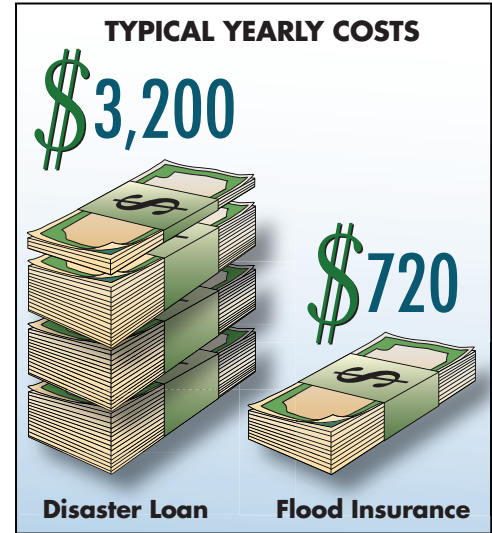
**Who needs flood insurance?** federal flood insurance is required for all buildings in mapped flood zones shown on FEMA's maps if they are financed by federally-backed loans or mortgages. All homeowners, business owners, and renters in communities that participate in the NFIP may purchase federal flood insurance on any building and its contents, even if outside of the mapped flood zone. Homes in mapped flood zones are five times more likely to be damaged by flooding than by major fires.

**Not in a mapped flood zone?** Unfortunately, it's often after a flood that many people discover that their home or business property insurance does NOT cover flood damage. Approximately 25% of all flood damage occurs in low risk zones, commonly described as being "outside the mapped flood zone."

**Protected by a levee or dam?** Even areas protected by levees or other flood control structures have some risk of flooding if the structures are overtopped or fail. Even when levees provide "100-year" flood protection, there is still a chance that a higher flood will cause flooding.

**What about disaster grants and loans?** Federal disaster grants do not cover most losses and repayment of a disaster loan can cost many times more than the cost of a flood insurance policy.

**Want to know more?** Learn more at [www.floodsmart.gov](http://www.floodsmart.gov). To purchase a policy, call your insurance agent. To find an insurance provider in your neighborhood, click on "How to Buy or Renew."



## The NFIP's Community Rating System (CRS)

The NFIP recognizes communities that achieve better flood resiliency by providing policy holders with reduced flood insurance premiums. Communities must apply to participate in CRS and commit to implement and certify activities that contribute to reduced flood risk. Examples of actions communities can take to reduce the cost of flood insurance premiums include:

- Preserve open space in the floodplain
- Enforce higher standards for safer development through zoning, stormwater, subdivision, and flood damage protection ordinances
- Develop hazard mitigation plans and watershed and stormwater management plans
- Undertake engineering studies and prepare flood maps
- Obtain grants to buy out or elevate houses or to floodproof businesses
- Maintain drainage systems
- Monitor flood conditions and issue warnings
- Inform people about flood hazards, flood insurance, and how to reduce flood damage



**Important**

### Information

Community officials can request assistance from CRS specialists to help with the application process and prerequisites. Check the online CRS Resource Center ([see page 83](#)).

In 2019, 92 California communities participated in the CRS. In those communities, property owners with buildings in mapped special flood hazard areas enjoy NFIP insurance premium discounts of 5% to 45% (and 5% to 10% in non-SFHA areas).

## NFIP Recommended Planning Considerations

California communities should consider incorporating planning considerations in comprehensive plans, land development codes, floodplain management regulations, and Local Mitigation Strategies to reflect the long-term goal of increasing resiliency to future flooding. NFIP regulations (Section 60.22(c)) outline 19 factors for consideration, including:

- Divert development to areas outside the SFHA to reduce flood damage
- Full public disclosure to potential buyers of properties in the SFHA
- Acknowledge that SFHA development may increase flood risk of existing development
- Improve local drainage to control increased runoff that increases the probability of flooding on other properties
- Require additional building elevation above the minimum (CCR Title 24 requires at least BFE + 1 foot of freeboard)
- Require elevation methods such as pilings or columns rather than fill to maintain the storage capacity of the floodplain and to minimize environmental impacts
- Require evacuation plans for manufactured home parks and subdivisions

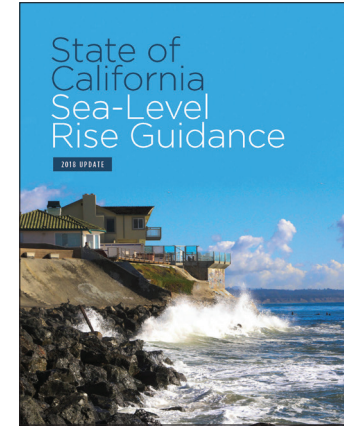
## Why Consider Sea Level Rise in Coastal Planning?

The *State of California Sea-Level Rise Guidance* (2018 Update) provides a science-based methodology for analysis and assessment of risks and vulnerabilities associated with sea-level rise for inclusion in state and community planning, permitting, and investment decisions. The Guidance is written for decision makers engaged in long-range community planning, infrastructure and public services, or development and permitting decisions.

A step-wise approach is outlined to help decision makers assess risk by evaluating a range of sea-level rise projections and the impacts or consequences of those projections. The approach can be used at the community level or for specific projects:

- **Step 1:** Identify the nearest tide gauge
- **Step 2:** Evaluate project lifespan
- **Step 3:** Identify range of sea-level rise projections for project lifespan
- **Step 4:** Evaluate potential impacts and adaptive capacity across range of projections
- **Step 5:** Select projection based on risk tolerance and develop adaptation pathways

Local emergency managers and floodplain officials participate in similar planning processes to develop multi-hazard mitigation plans required to access FEMA post-disaster recovery funds and hazard mitigation grant funds.




<http://www.opc.ca.gov/updates/californias-sea-level-rise-guidance/>

## Understand the Range of Sea-Level Rise Scenarios

The important first step is to understand the impacts of a range of sea-level rise scenarios, including low, medium-high, and extreme risk scenarios.

Sea-level rise is not used by FEMA to prepare Flood Insurance Rate Maps ([see page 10](#)).

The *Sea-Level Rise Guidance* describes and links to a number of geospatial and visualization tools useful for identifying existing and future development and infrastructure that will be vulnerable. Sea-level rise visualization tools are available here: <https://resilientca.org/tools/>



**Terms and Definitions**

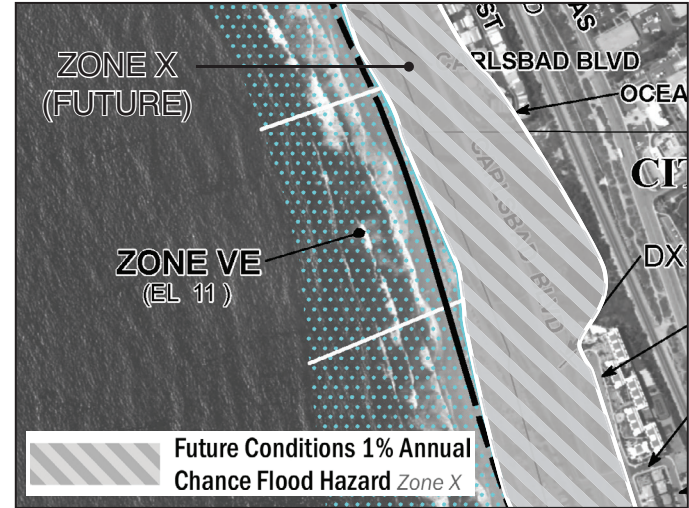
**Vulnerability assessments**  
identify who and what is exposed and sensitive to change, considering factors that expose and make people, property, and environmental features susceptible to harm.

Find resources offered by state agencies and local and regional governments by visiting the Governor's Office of Planning and Research at <http://opr.ca.gov/clearinghouse/adaptation/>

## FIRMs: Existing and Future Coastal Flood Hazards

Flood Insurance Rate Maps show SFHAs based on historical flood events and analytical methods to determine “existing conditions” SFHAs. Future conditions, including increased runoff from developing watersheds, is not mapped on FIRMs. Rising sea levels will worsen coastal flooding beyond SFHAs shown on FIRMs by:

- Increasing the frequency of storms
- Extending flooding further inland
- Increasing wave heights
- Accelerating shore and bluff erosion
- Inhibiting storm water drainage



Communities may map and regulate areas subject to flooding in addition to SFHAs shown on FIRMs. The California Building Standards Code accommodates additional maps (see definitions for “flood hazard area” and “design flood”).

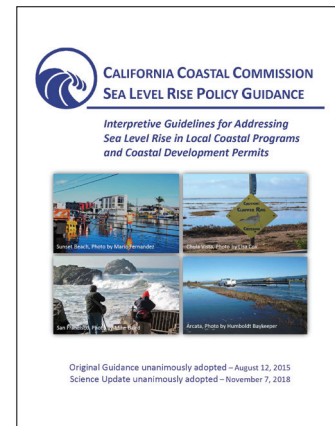
Communities that map and regulate areas subject to sea level rise not only better protect people and property, they may qualify for credit under the NFIP Community Rating System ([see page 6](#)).

## Identifying Adaptation Strategies in the Planning Process

A wide range of adaptation strategies are describe in Chapter 7 of The *California Coastal Commission Sea Level Rise Policy Guidance* (2018 Update) and grouped under protect, accommodate, retreat, and hybrids of those strategies. Strategies that communities might implement as part of floodplain management programs include:

- Modify density in areas expected to experience the most significant increased flooding
- Require new buildings to be elevated higher than required by the California building codes
- Apply floodplain management requirements in areas subject to future sea-level rise flooding
- Update siting and design standards for roads and infrastructure
- Expand outreach and public education to include information about future flood risks
- Update Local Coastal Program (LCP) and local planning documents

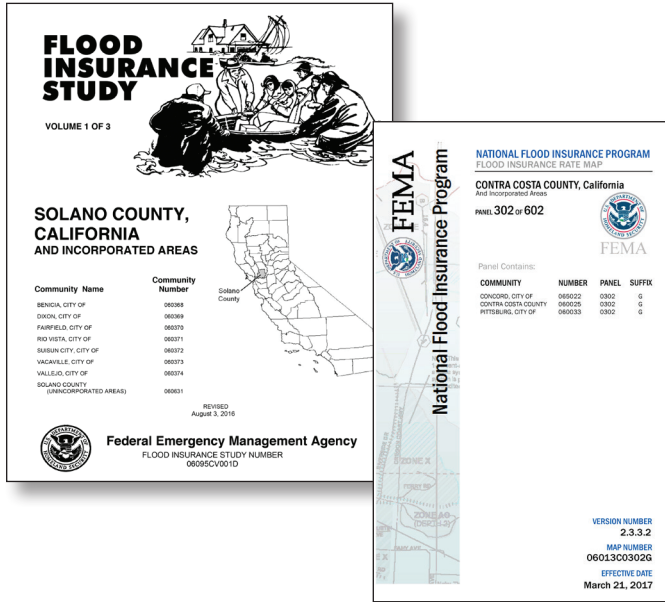
The California Coastal Commission suggests including sea level rise in coastal flood hazard maps, the Geologic Setback Line (bluff setback), tsunami hazard assessments, and subdivision lot layouts.



<https://www.coastal.ca.gov/climate/slrguidance.html>



## Looking for FEMA Flood Map Information?



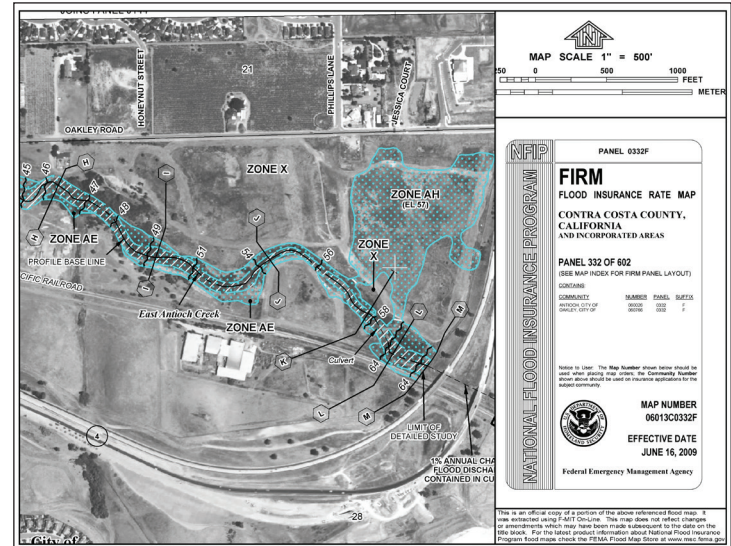
- Flood Insurance Studies (FISs) are compilations of flood risk information used for community planning and development.
- Flood Insurance Rate Maps (FIRMs) show flood zones subject to regulations and where federal flood insurance is required.
- Access FIRMs at the FEMA Flood Map Service Center at <https://msc.fema.gov>, where current and historical flood maps may be viewed and downloaded.
- Access the National Flood Hazard Layer, a geospatial database with current effective data, at <https://www.fema.gov/national-flood-hazard-layer-nfhl>.
- Many cities and counties also make digital flood maps available online, sometimes with property parcel data.

**Need a fast answer?** Community planning, engineering, or permit offices may also have paper flood maps available for viewing by the public.

## FIRMette: FEMA Flood Maps Online

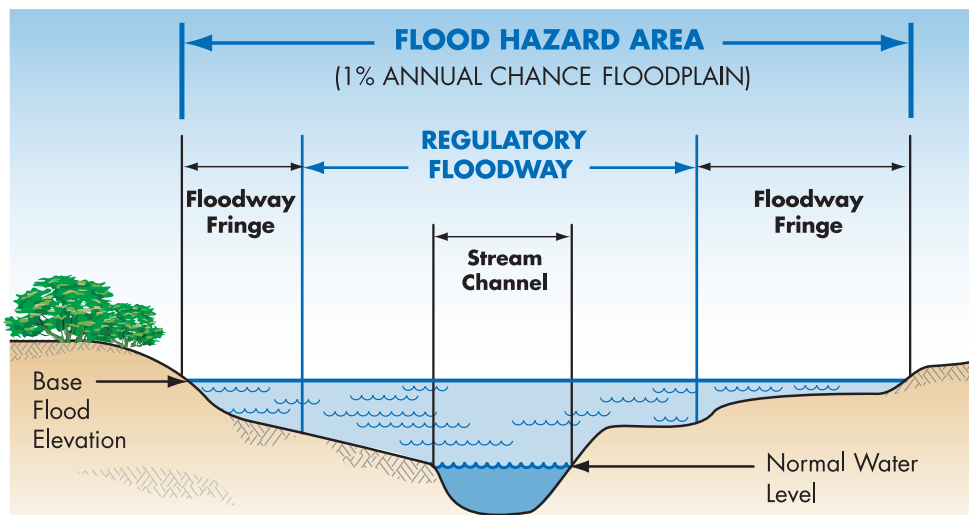
Portions of flood maps can be produced, saved, and printed by making a "FIRMette." FIRMettes are full-scale sections of FIRMs.

- A tutorial on FIRMettes and downloading FIRM panels is available at [www.fema.gov/media-library/assets/documents/34930](http://www.fema.gov/media-library/assets/documents/34930).
- Making a FIRMette is easy after a property is located. Use the <Search by Address> link or <Search All Products> to find the community and map panel of interest.
- Earlier versions of FIRMs are available for many communities, so current flood hazard information can be compared to historic data.



Go to [www.msc.fema.gov](http://www.msc.fema.gov) and check out the "MSC Frequently Asked Questions." For step-by-step instructions on how to read flood maps, view the How to Read a Flood Insurance Rate Map Tutorial.

## Understanding the Riverine Floodplain



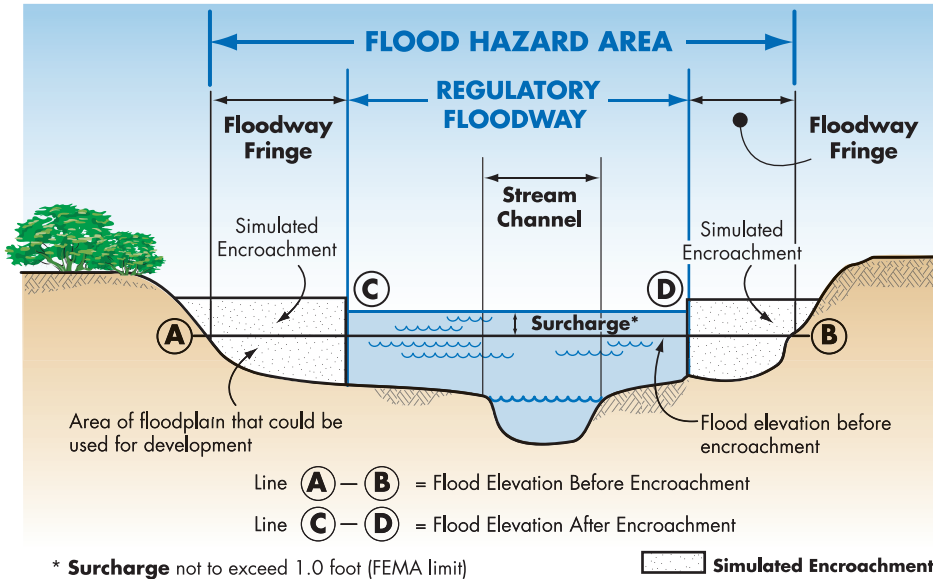
For riverine floodplains with base flood elevations (BFEs) determined by detailed flood studies, the Flood Profile in the Flood Insurance Study shows water surface elevations for different frequency floods ([see page 18](#)).

### Terms and Definitions

The **Special Flood Hazard Area (SFHA)** is that portion of the floodplain subject to inundation by the base flood (1% annual chance) and/or flood-related erosion hazards. Riverine SFHAs are shown on FIRMs as Zones A, AE, AH, AO, AR, and A99. Older FIRMs may have Zones A1-A30.

[See page 15](#) to learn about the floodway, the area of the regulatory floodplain where flood waters usually are deeper and flow faster.

# Understanding the FEMA Floodway



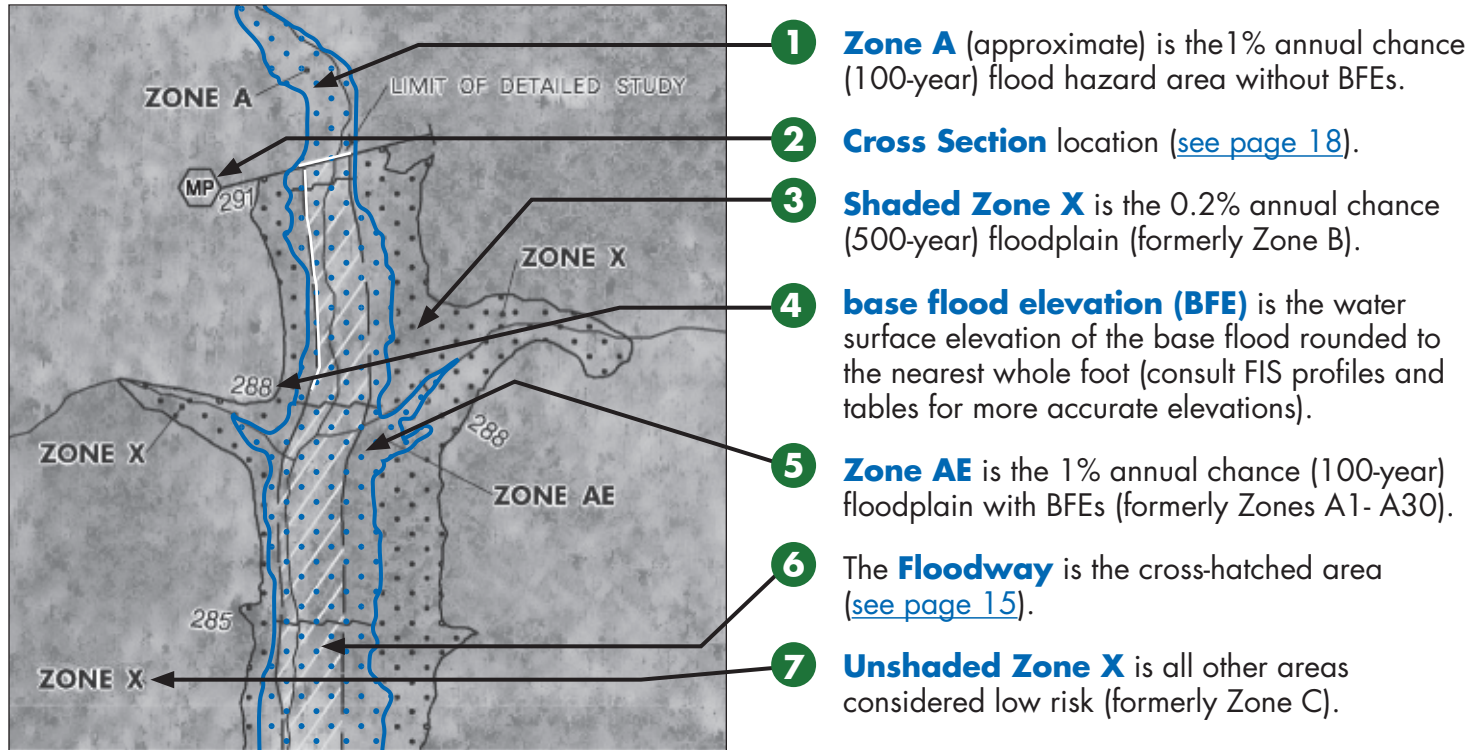
## Terms and Definitions

The **Floodway** is the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to pass the base flood discharge without cumulatively increasing flood elevations.

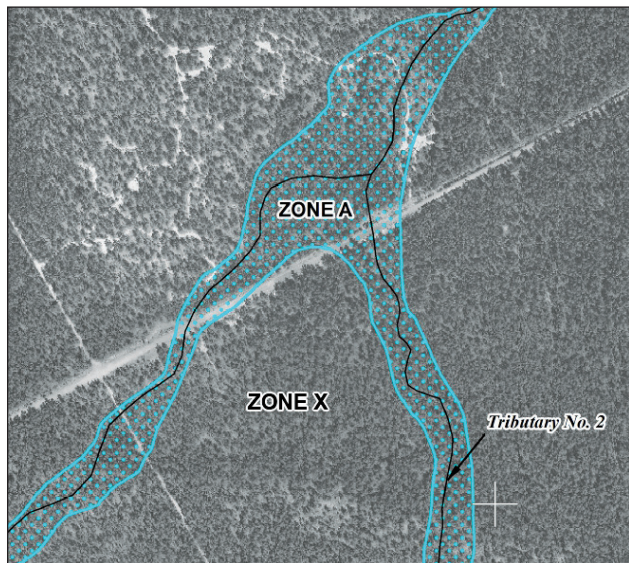
Computer models are used to simulate “encroachment” or development in the floodway fringe in order to predict where and how much the base flood elevation would increase if the floodway fringe is allowed to be developed.

For any proposed floodway development, the applicant must provide evidence that “no rise” in flood elevation will occur or obtain a Conditional Letter of Map Revision (CLOMR) before a local floodplain permit can be issued ([see page 27](#)). Experienced registered professional engineers must make sure proposed projects either won’t increase flooding or that any increases do not impact structures on other properties.

## Flood Insurance Rate Map (Riverine)




## Approximate Flood Zones



FEMA uses existing information – not engineering studies – to draw Approximate Zone A boundaries. Information may be provided by the U.S. Army Corps of Engineers, other federal agencies, State and local agencies, and historic records.

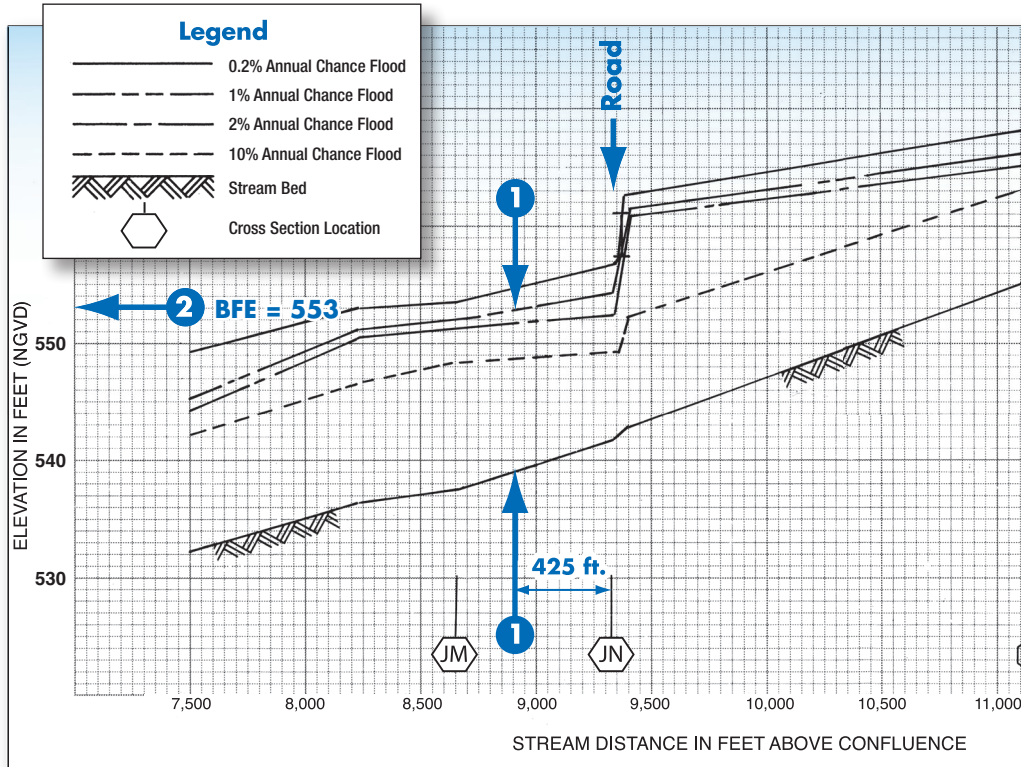
For assistance determining BFEs, contact community planning, engineering or permit offices or water management districts. Useful guidance for local officials and engineers is found in FEMA 265, *Managing Floodplain Development in Approximate Zone A Areas*.

 **Terms and Definitions**

An **Approximate Zone A** is a special flood hazard area where BFE information is not provided.

If data are not available from another source, and provided there is no evidence indicating flood depths have been or may be greater than two-feet deep, local officials may specify the BFE is two feet above the highest adjacent grade.

## Using the Riverine Flood Profile to Determine Riverine BFEs



Flood Profiles from Flood Insurance Study reports can be used to determine the BFE at a specific site. Profiles also show estimated water surface elevations for floods other than the 1% annual chance flood (100-year).

- On the effective flood map, locate the site by measuring the distance, along the profile baseline of the stream channel, from a known point such as a road or cross section, for example, JM or JN.
- Scale that distance on the Flood Profile and read up to the profile of interest, then across to determine the BFE, to the nearest 1/10 of a foot. (Answer: 553 feet).

## Floodway Data Table

Flood Insurance Studies have Floodway Data Tables for every waterway that was studied by detailed methods for which floodways were delineated.

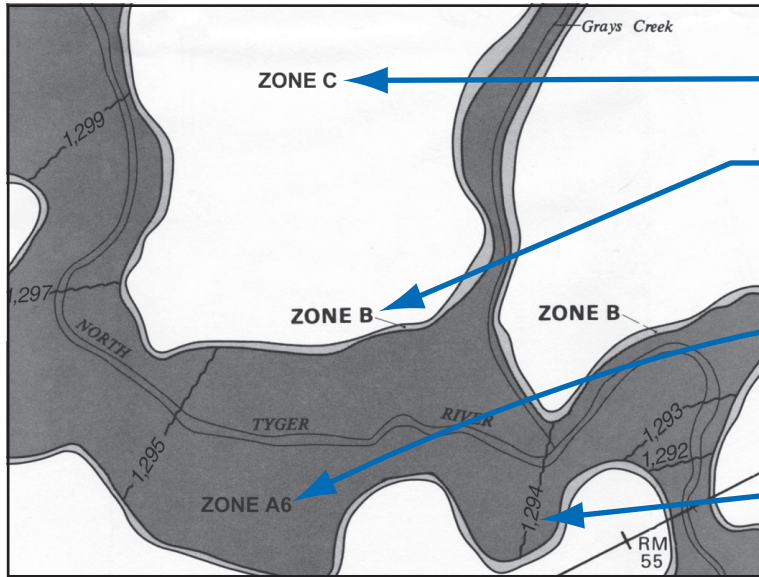
FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY (FEET NAVD 88)	WITHOUT FLOODWAY (FEET NAVD 88)	WITH FLOODWAY (FEET NAVD 88)	INCREASE (FEET)
<b>Bucktown Creek</b>								
A	1,426	120	1,205	0.4	241.1	241.1	242.1	1.0
B	1,848	11	535	0.8	241.2	241.2	242.2	1.0
C	2,270	40	179	2.5	241.3	241.3	242.3	1.0
D	3,221	38	113	3.9	248.1	248.1	248.1	0.0
E	3,854	10	82	5.4	256.9	256.9	256.9	0.0
F	3,907	38	170	2.6	260.9	260.9	261.1	0.2
G	4,277	32	57	7.7	263.7	263.7	263.9	0.2

<sup>1</sup>Stream distance in feet above confluence with Bucktown Creek.

- 1 Velocity estimates based on the mean velocity data may be used to compute hydrodynamic loads.
- 2 Compute BFE (rounded values are shown on FIRMs).
- 3 Elevations may not consider backwater effect from downstream river.
- 4 Amount of allowed increase – not more than 1.0 foot at any location.



## Old Format Flood Insurance Rate Map

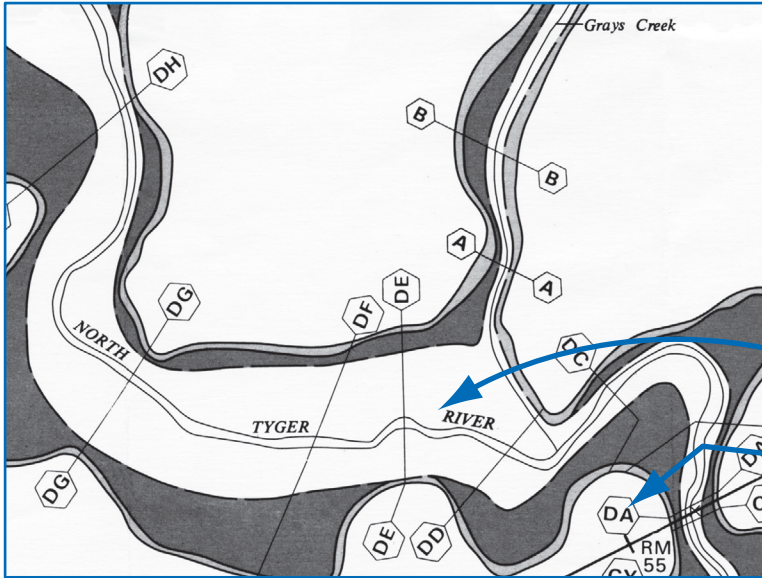


### FLOOD HAZARD ZONES

- 1 Zone C** (or Zone X) is all areas considered to be low risk.
- 2 Zone B** (or shaded Zone X) is subject to flooding by the 500-year flood (0.2% annual chance), and other moderate risk areas.
- 3 Zone A, Zones A1-A30 or Zone AE** are subject to flooding by the base or 100-year flood (1%-annual-chance), and are considered high risk areas.
- 4 base flood elevation (BFE).** Water surface elevation of the base flood at specific locations.

FEMA prepares Flood Insurance Rate Maps (FIRMs) to show areas that are at high risk of flooding. These “old format” FIRMs, and companion Flood Boundary and Floodway Maps ([next page](#)), are being revised and digitized as part of FEMA’s nationwide revision initiative ([see page 28](#)).

## Old Format Flood Boundary and Floodway Map



### Important

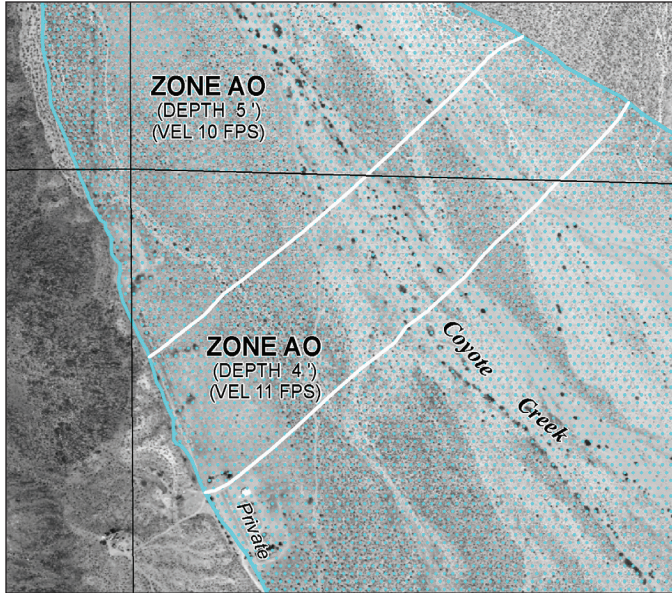
#### Information

Floodway maps do not show flood zones or BFEs. Check the companion FIRM for that information. [Page 22](#) shows the FIRM that matches the map clip to the left.

- 1 The Floodway** is the white area around the waterway centerline.
- 2 Cross Section** location, where ground surveys determined the shape of the land and how constrictions such as bridges and culverts affect the flow of floodwater.

FEMA prepared Floodway maps as companions to many “old format” FIRMs. You should check to see if your project will be in the Floodway because additional engineering may be required ([see page 15](#)).

## Alluvial Fan Flooding Requires Special Attention

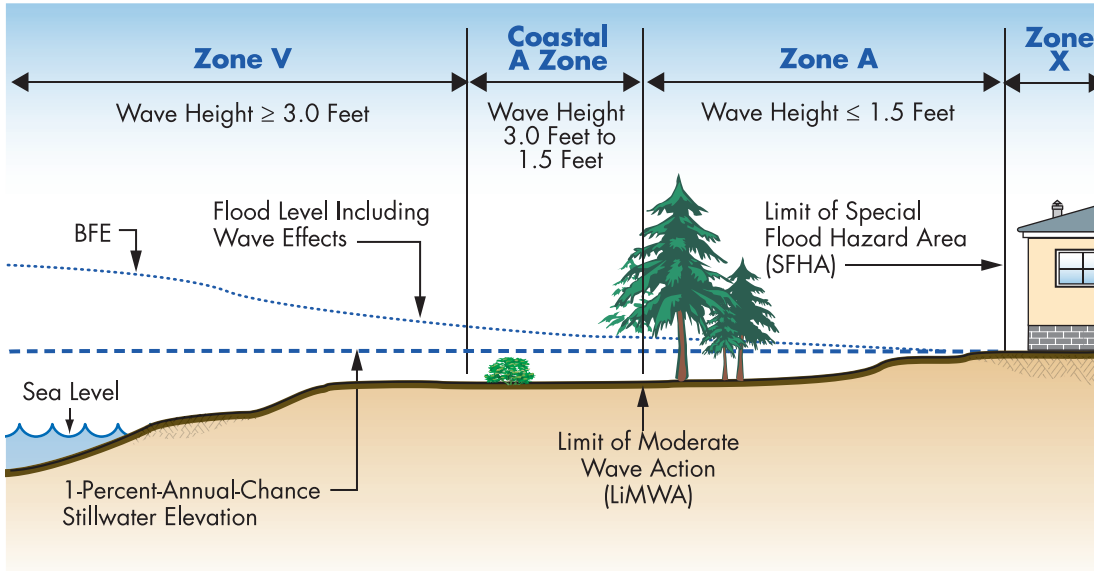


Alluvial fan flood hazard areas are shown on FIRMs as AO Zones with a “depth number” and anticipated velocity. Special attention is required if buildings are proposed in these areas:

- Lowest floors must be elevated at least as high as the depth number above the highest adjacent grade (CCR Title 24 requires freeboard).
- Buildings may be elevated on a fill pad or a raised foundation – fills and foundations must be designed by a qualified registered professional engineer to resist the anticipated flood depths, erosion, and velocities.
- Drainage and grading must prevent directing water, sediment and debris flows onto adjacent properties.

Some of California’s mountains have alluvial fans at their base. Alluvial fans are a landform created where floodwaters rushing off the steep mountains spread out and deposit sand, cobble, and rocks.

## Understanding the Coastal Floodplain



Areas subject to Coastal A Zone conditions (wave heights between 3 feet and 1.5 feet) may not be shown on FIRMs ([see page 25](#)).

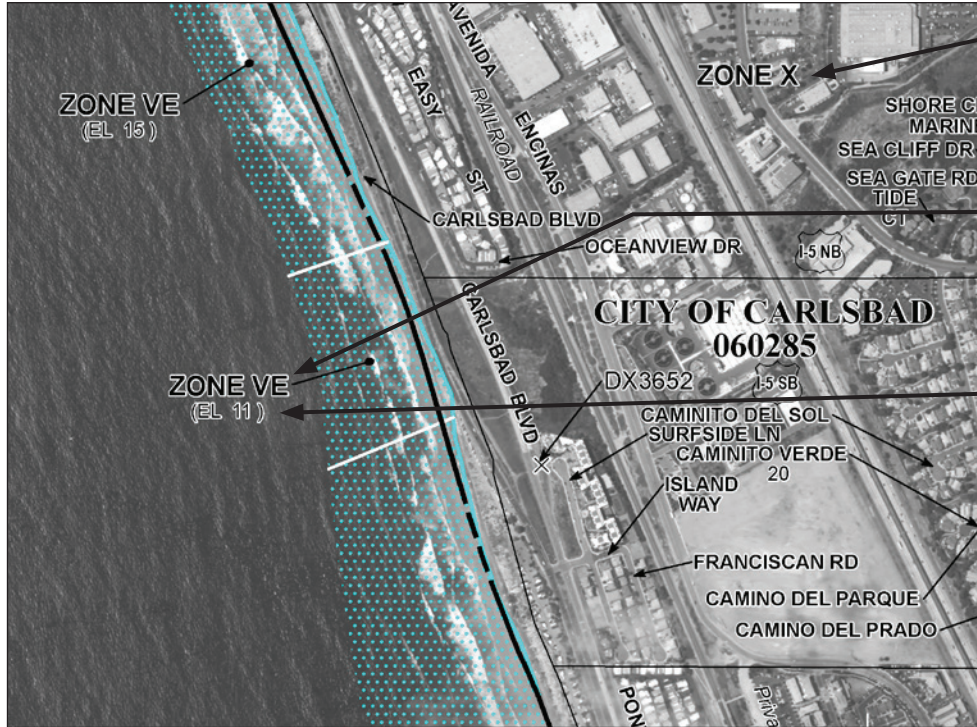
As of late 2019, FEMA has not delineated a Limit of Moderate Wave Action on FIRMs in California.

## Terms and Definitions

The **Coastal High Hazard Area (Zone V)** is the special flood hazard area that extends from offshore to the inland limit of a primary frontal dune along an open coast and any other area subject to high velocity wave action. The area is designated on the FIRM as Zone VE.

The term **Coastal A Zone (CAZ)** refers to a portion of the SFHA landward of a Zone V or landward of an open coast without Zone V. CAZs may be subject to breaking waves between 3 and 1.5 feet high.

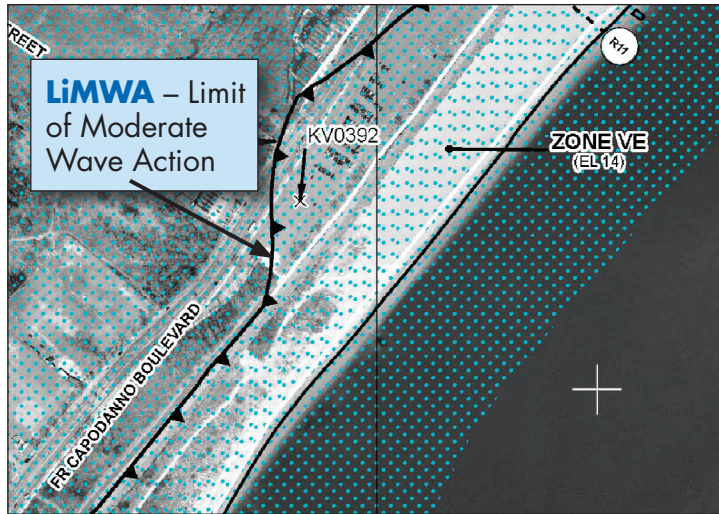
## Flood Insurance Rate Map (Coastal)



- 1 Unshaded Zone X** is the area of minimal flood risk outside the 0.2% annual chance (500-year) floodplain.
- 2 Zone VE** is the 1% annual chance (100-year) floodplain where wave heights are expected to be 3 feet or more.
- 3 Base flood elevation (BFE)** is the water surface elevation (in feet above the vertical datum shown on the map).

Because of the Pacific shoreline morphology, most FIRMs do not show Zone AE inland of Zone V or Shaded Zone X (500-year).

## The Coastal A Zone (CAZ)



### Legend

▲▲▲ Limit of Moderate Wave Action

### Notes to Users

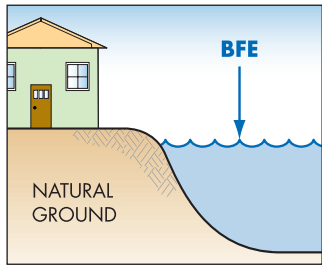
AE Zone has been divided by a Limit of Moderate Wave Action (LiMWA). The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. The effects of wave hazards between the VE Zone and the LiMWA (or between the shoreline and the LiMWA for areas where VE Zones are not identified) will be similar to, but less severe than, those in the VE Zone.

- Post-flood evaluations and laboratory tests confirm that breaking waves as small as 1.5 feet high cause damage to walls and scour around foundations.
- The Limit of Moderate Wave Action may be shown on revised FIRMs to delineate the inland extent of Coastal A Zone conditions inland of Zone V or along shorelines without Zone V.
- Scour and erosion should be considered in CAZ if soils are sandy and erodible.
- Federal flood insurance in CAZs is rated using Zone A rates (lower than Zone V rates).

If a LiMWA is delineated or a community designates a CAZ, the California Building Standards Code requires buildings to comply with Zone V construction requirements, except backfilled stemwall foundations are allowed.

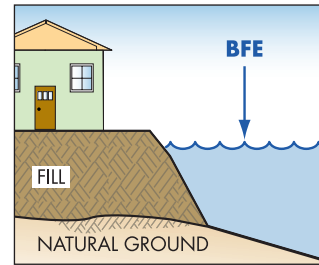
## FIRM Revisions: LOMAs and LOMR-Fs

The most accurate information available is used to make flood maps, including topographic base maps and detailed engineering methods or methods of approximation. FEMA issues map revisions if technical data are submitted to support the changes.



**Letter of Map Amendment (LOMA)** is an official amendment to an effective FIRM that may be issued when a property owner provides additional technical information from a professional land surveyor, such as ground elevation

relative to the BFE. Lenders may waive the flood insurance requirement if the LOMA removes a building site from the SFHA because natural ground at the site is at or above the BFE.



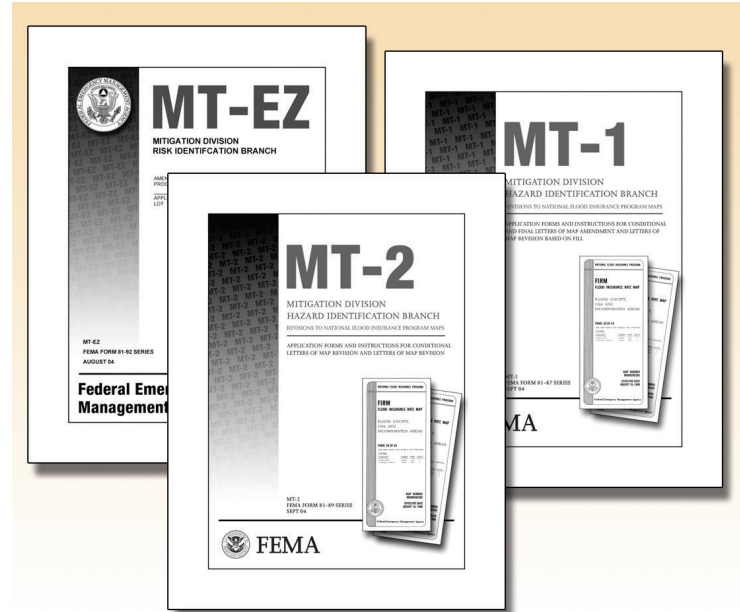
**Letter of Map Revision Based on Fill (LOMR-F)** is an official revision to an effective FIRM that is issued to document FEMA's determination that a structure or parcel of land has been

elevated by fill above the BFE, and therefore is no longer in the SFHA. Lenders may waive the insurance requirement if the LOMR-F removes a building site from the SFHA.

Check [www.fema.gov/letter-map-amendment-letter-map-revision-based-fill-process](http://www.fema.gov/letter-map-amendment-letter-map-revision-based-fill-process) for guidance on map revisions. Access to FEMA's web-based application for professional land surveyors and civil engineers to submit eLOMAs is [hazards.fema.gov/femaportal/resources/whatiseloma.htm](http://hazards.fema.gov/femaportal/resources/whatiseloma.htm).

## FIRM Revisions: CLOMRs and LOMRs

- **Conditional Letter of Map Revision (CLOMR)** comments on whether a proposed project, if built as shown on the submitted documentation, would meet the standards for a map revision. Communities should require this evidence prior to issuing permits for fill or alteration of a watercourse. Certificates of Occupancy/Compliance should be withheld until receipt of the final LOMR based on “as-built” documentation and certification.
- **Letter of Map Revision (LOMR)** is an official revision to an effective FIRM that may be issued to change flood insurance risk zones, special flood hazard areas and floodway boundary delineations, BFEs and/or other map features. Lenders may waive the insurance requirement if the approved map revision shows buildings to be outside of the SFHA.



To learn more and download forms, find links by searching key words “MT-EZ,” “MT-1,” and “MT-2.”

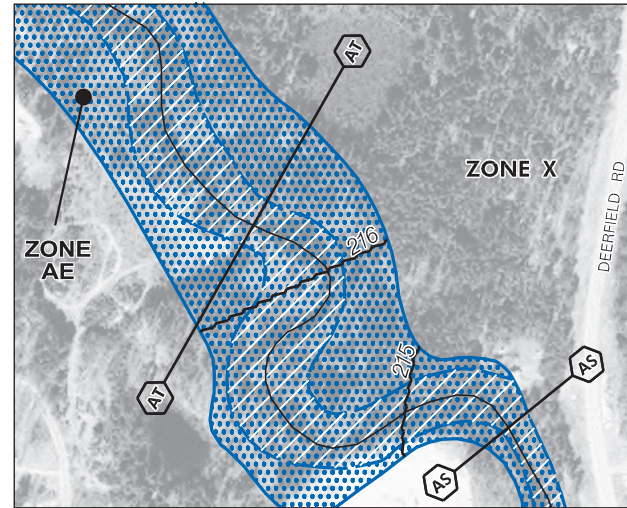


## Modernizing Flood Map

The Department of Water Resources, FEMA, the U.S. Army Corps of Engineers, and California communities are cooperating to modernize the flood maps.

All new and revised flood maps will be designed to view digitally on a computer within a geographic information system (GIS) or as paper maps. Flood maps will be composites of base data, topographic data, and flood layers which can be overlain with parcel information or other data to more easily determine if a house or other property is or will be located in a special flood hazard area or floodway.

DWR's Awareness Floodplain Maps are prepared using approximate assessment procedures. The maps show potential flood risk areas (without flood depths) that have not been mapped by FEMA. To learn more and check for awareness floodplain maps in your area, visit <https://gis.bam.water.ca.gov/bam/>.



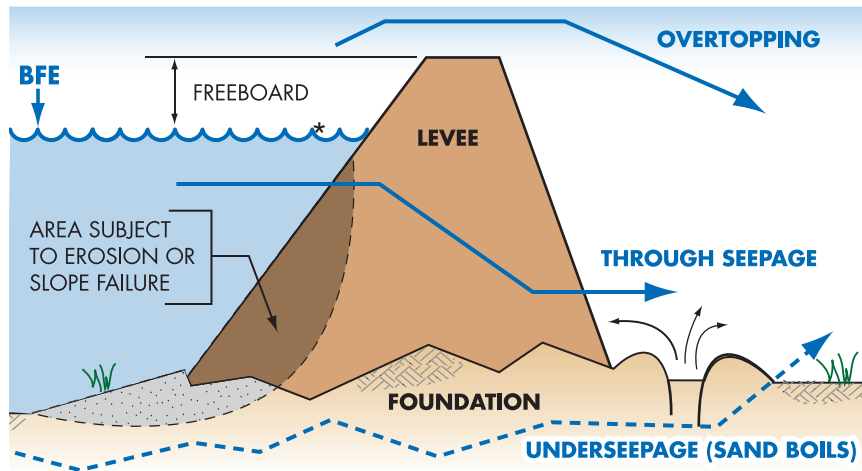
This map uses aerial photography (topographic layer not shown)

Learn more about FEMA's multi-year Risk MAP program at <https://www.fema.gov/risk-mapping-assessment-and-planning-risk-map>

## Levee Certification for FIRMs

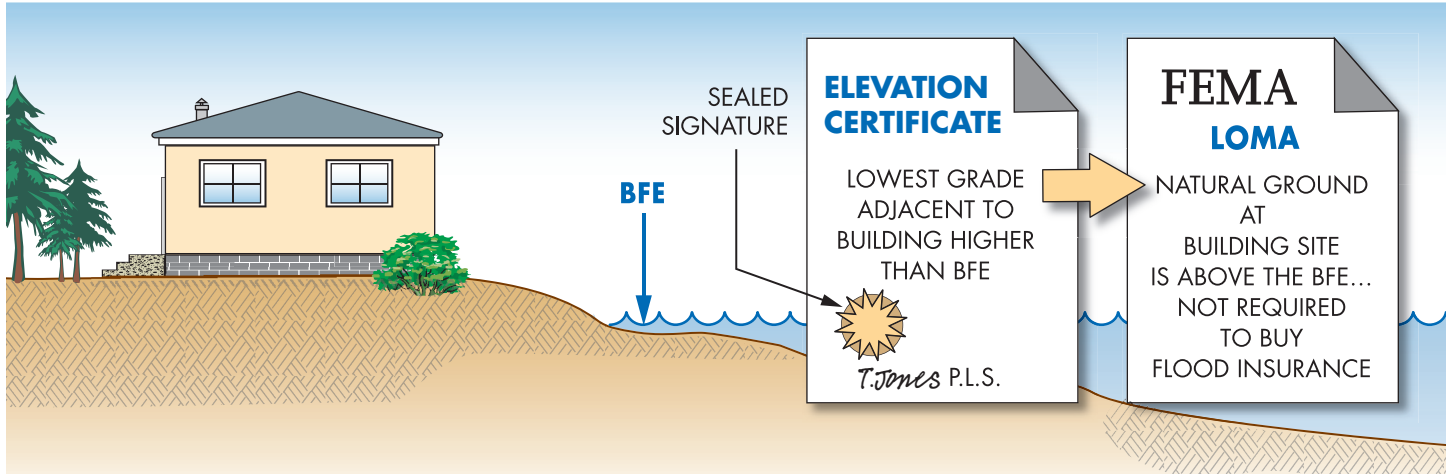
Many levees are designed to protect land against flooding from the base flood. In order for FEMA to show those areas as outside of the special flood hazard area, communities and levee owners must certify that levees meet certain design criteria. Certification will present significant challenges during the map revision process. Pursuant to FEMA's Procedural Memoranda 34 and 43, and as outlined in federal regulations at 44 CFR Section 65.10, the documentation requirements address:

- Freeboard
- Closures
- Embankment protection for erosion
- Embankment and foundation stability
- Settlement
- Interior drainage and seepage
- Operation and maintenance plans
- Other site specific criteria



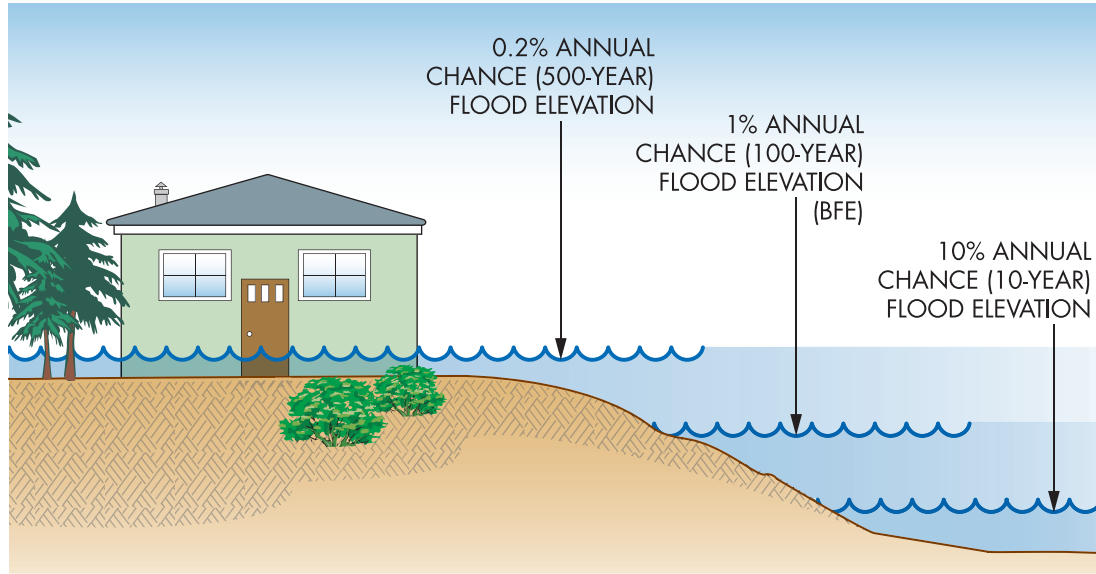
\* Freeboard is the distance between the BFE and the top of the levee; for FEMA accreditation freeboard is usually 3 feet

## Are Building Sites Higher than the BFE?



If land is shown on the map as “in” the SFHA, but the building site is higher than the base flood elevation (BFE)... get a California licensed professional land surveyor or civil engineer to complete a FEMA Elevation Certificate (EC). Submit a request for a Letter of Map Amendment to FEMA along with the EC to verify that the structure is above the BFE ([see page 26](#)). If FEMA approves the request, lenders are not required to require flood insurance policies, although some may still require them. Owners should keep certificates and LOMAs with deeds — the documentation will help future buyers.

## Floods Don't Always Stop at the BFE



Important

### Information

Many people don't understand just how risky building in flood zones can be. There is a greater than 26% chance that a non-elevated home in the SFHA will be flooded during a 30-year mortgage period. The chance that a major fire will occur during the same period is less than 5%!

**CAUTION!** Major storms and flash floods can cause flooding that rises higher than the base flood elevation (BFE). Be safer – protect your home or business by avoiding flood zones or building higher. [See page 40](#) to see how this will save you money on flood insurance.

## Avoid Flood Hazard Areas When Possible

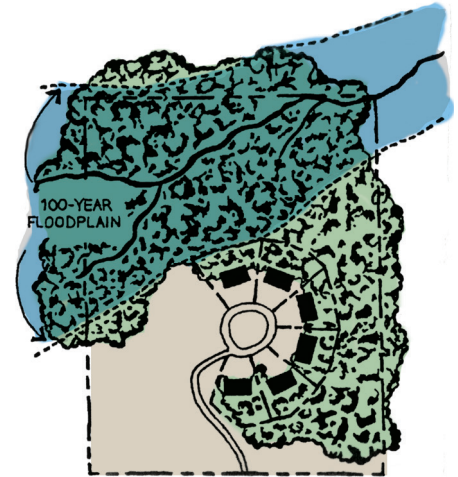


All land subdivided into lots, some homesites and lots partially or entirely in the floodplain.

**NOT RECOMMENDED**

All land subdivided into lots, some lots partially in the floodplain, setbacks modified to keep homesites on high ground.

**RECOMMENDED**



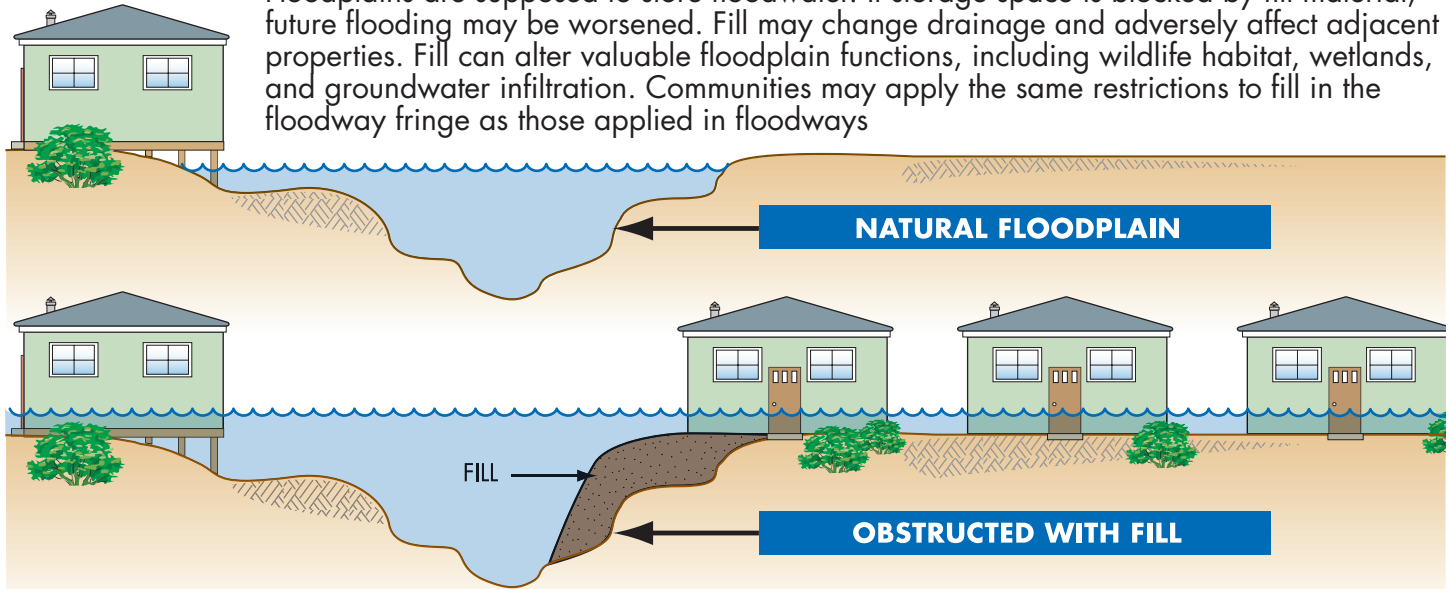
Floodplain land put into public/common open space, net density remains, lot sizes reduced and setbacks modified to keep homesites on high ground.

**RECOMMENDED**

Let the floodplain perform its natural function – if possible, keep it as open space. Other compatible uses: Recreational areas, playgrounds, reforestation, unpaved parking, gardens, pasture, and created wetlands.

## Fill Can Adversely Affect Floodplain Functions

Floodplains are supposed to store floodwater. If storage space is blocked by fill material, future flooding may be worsened. Fill may change drainage and adversely affect adjacent properties. Fill can alter valuable floodplain functions, including wildlife habitat, wetlands, and groundwater infiltration. Communities may apply the same restrictions to fill in the floodway fringe as those applied in floodways



Communities should make sure fill in flood zones won't harm neighboring properties. Before deciding to use fill, property owners should check with local planning, engineering, or permit offices. Engineering analyses may be required to demonstrate that fill will cause "no rise" ([see page 34](#)).

## The Regulatory Floodway "No Rise" Certification

- Floodways convey the largest volume of water and may have high velocities.
- Some communities restrict development in regulatory floodways.
- Engineers must prepare floodway encroachment analyses to evaluate the hydraulic impact of proposed development.
- Development is not allowed unless certified to cause "no rise" (no increase) in base flood elevations.
- "No rise" certifications must be signed, sealed, and dated by a Professional Engineer licensed in California and qualified to conduct hydraulic analyses.

**XYZ Engineering, Inc.,  
Anytown, California**

Mr. Floodplain Manager  
1000 Main Street  
Anytown, CA

Re: 1200 Jackson Street  
Anytown, CA

This is to certify that I am a duly qualified Professional Engineer licensed to practice in the State of California. It is to further certify that the attached technical data supports the fact that the proposed (Name of Development) will not increase Base Flood Elevations, floodway elevations and the floodway widths on (Name of Stream) as published in the Flood Insurance Study for (Name of Community), dated (Date of Effective FIS).

*A.J. Smith* P.E.

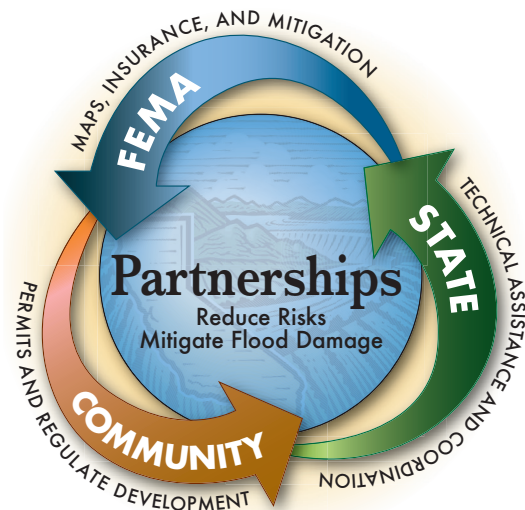


The floodway encroachment analysis must be based on technical data obtained from FEMA.

**Reduce flood risk – don't build in the Floodway!**

## Activities in SFHAs that Require Local Permits and Approvals

- Construction of new buildings
- Additions to buildings
- Substantial improvements of buildings
- Renovation of building interiors
- Repair of substantially damaged buildings
- Placement of manufactured (mobile) homes
- Subdivision of land
- Construction or placement of temporary buildings and accessory structures
- Construction of agricultural buildings
- Construction of roads, bridges, and culverts
- Placement of fill, grading, excavation, mining, and dredging
- Alteration of stream channels



Floodplain development or building permits must be obtained before these and **ANY** land-disturbing activities occur in flood zones.



## Some Key Floodplain Permit Review Steps

The permit reviewer must check many things. Some of the key questions are:

- Is the site near a watercourse or shoreline?
- Is the site in a FEMA mapped SFHA or floodway or subject to the Central Valley Flood Protection Board requirements ([see page 79](#))?
- Are applicants advised that other state or federal permits must be obtained before work starts?
- Is the site reasonably safe from flooding?
- Does the site plan show the flood zone, base flood elevation and building location?
- Is substantial improvement or repair of substantial damage proposed?
- Is an addition proposed?
- Will new buildings and utilities be elevated properly?
- Will manufactured homes be properly elevated and anchored?
- Do the plans show an appropriate and safe foundation?
- Are all required design certifications submitted?
- Will the owner/builder have to submit an as-built Elevation Certificate?

### REVIEW CHECKLIST

- FLOODPLAIN
- FLOODWAY
- BFE
- NEW CONSTRUCTION
- IMPROVED EXISTING BUILDING
- ELEVATED
- ELEVATION CERTIFICATE
- ISSUE PERMIT

*Roberto Reviewer* C.F.M.

## Fundamentals of Flood Resistant Construction

The flood resistant construction requirements of the NFIP and the California Building Standards Code (CCR Title 24) share the common objective of increasing resistance to flooding. Although there are some differences between specific requirements, they all include the following fundamentals – buildings should have:

- **Foundations** capable of resisting flood loads (including dry floodproofed nonresidential buildings)
- **Structurally sound walls and roofs** capable of minimizing penetration by wind, rain, and debris
- **Lowest floors elevated** high enough to prevent floodwaters from entering during the design event
- **Equipment and utilities** elevated or designed to remain intact and be restored easily
- **Enclosures below elevated floors** limited to parking, limited storage, and building access and are designed to minimize damage
- **Flood damage-resistant materials** used below elevated lowest floors

In short ... flood resistant buildings!

## Flood Provisions in the California Building Standards Code

CCR Title 24 includes flood provisions that meet or exceed the NFIP requirements for buildings and structures. All counties, cities and towns are required to enforce the building code. Many California communities enforce some “higher standards” than those required by the code.

- **Part 2 (Building):** Flood provisions are primarily in Section 1612 Flood Loads, which refers to the standard *Flood Resistant Design and Construction* (ASCE 24).
- **Part 2.5 (Residential):** Flood provisions are primarily in Section R322 Flood-Resistant Construction, although there are requirements in several other sections.
- **Part 10 (Existing Building):** Flood provisions are found in sections on repairs, alterations, additions, and historic structures and in sections on prescriptive and performance compliance methods.
- **Part 4 (Mechanical) and Part 5 (Plumbing):** Flood provisions are in a number of sections.



Excerpts of the flood provisions of CCR Title 24, “Highlights of ASCE 24,” and other building code resource materials are available online <https://water.ca.gov/nfip/>.

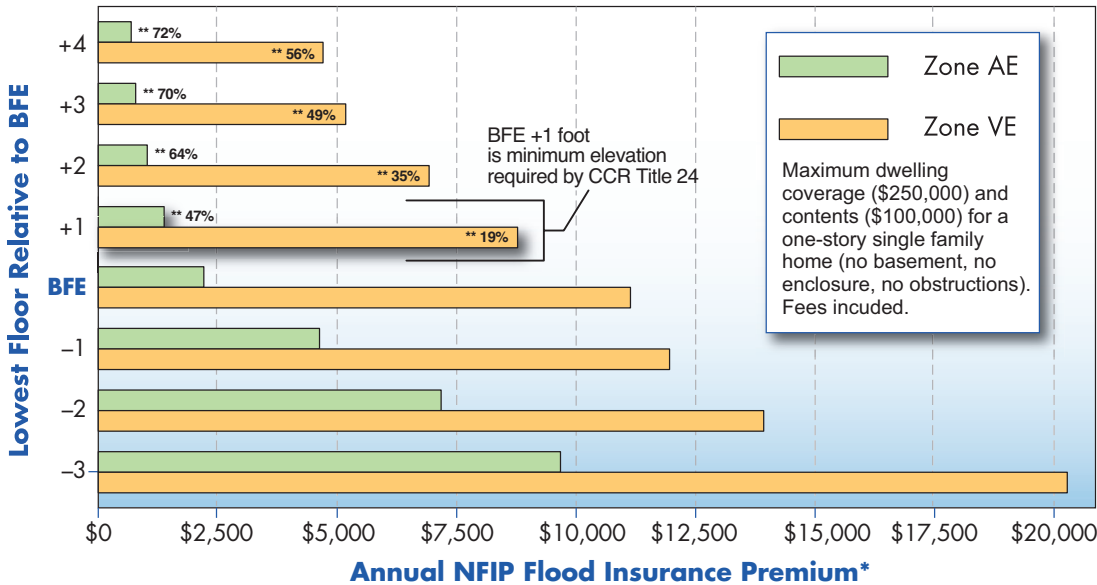
## Specific Requirements in CCR Title 24

The California Building Standards Code includes requirements that may differ from NFIP and local floodplain management regulations – the more restrictive prevail:

- **Requires Freeboard.** Minimum BFE plus 1 foot for buildings in all flood zones
- **Critical Facilities.** Elevated or protected to the higher of BFE plus 2 feet or 500-year flood elevation
- **Coastal A Zone.** If delineated, regulated like Zone V with backfilled stemwalls permitted
- **Local Scour and Erosion.** Must be considered for foundations in Zone V and CAZ
- **Flood Openings.** Required in at least two walls of all enclosures below elevated buildings, including breakaway walls; performance of engineered flood openings emphasized
- **Exterior Door.** Required at top of stairways enclosed by breakaway walls
- **Dry Floodproofing.** Permitted only for nonresidential buildings and must be designed in accordance with ASCE 24
- **Mixed Use.** Defined in ASCE 24 commentary for limitations on dry floodproofing nonresidential portions of mixed use buildings

## Freeboard: Build Higher, Reduce Damage, Save on Insurance

Freeboard is additional height – a factor of safety – above the BFE. Buildings that are higher than the BFE experience less damage. The California Building Standards Code requires all buildings to be elevated to at least BFE plus 1 foot. Owners of buildings elevated above the BFE also save on federal flood insurance.



\* Unofficial estimates using 2019 rates; use only for comparison purposes

\*\* Savings over at-BFE premium



Important

### Information

**NOTE!** Flood insurance rates and various fees change from time to time. Rather than specific costs for insurance, these figures give a feel for how much difference just a foot or two can make.

**Remember!** Builders must submit floor elevations as part of foundation inspections. An error of just 6 or 12 inches could more than double the cost of federal flood insurance.

A community may be able to grant a variance, but the owner will probably be required to buy insurance. Imagine trying to sell a house if the bank requires insurance that costs more than \$9,000 to \$20,000 a year!

## Variations From Elevation Requirements

Very specific conditions related to the property (not the owner's actions or preferences) must be satisfied to justify a variance:

- Compliance would result in exceptional noneconomic hardship due to the unique conditions not common with adjacent properties
- Variance does not result in threats to public safety or extraordinary public expense
- Variance does not create a nuisance, cause fraud and victimization of the public, or conflict with other laws and regulations
- If in floodway, no increase in flood levels would result
- Applicant has shown good and sufficient cause
- Variance is the minimum necessary to provide relief



Variance means a grant of relief from the floodplain management requirements which permits construction in a manner that would otherwise be prohibited and where specific enforcement would result in exceptional hardship.

Property owners and communities must carefully consider the impacts of variances to allow buildings below the BFE. Not only will buildings be more likely to sustain flood damage, but federal flood insurance will be very costly ([see page 40](#)). Communities with a pattern of granting variances may be subject to NFIP sanctions, costing all insurance policyholders even more. For guidance, see *Variations and the National Flood Insurance Program* (FEMA P-993).

## Carefully Complete the Permit Application

Owner's Name <i>David &amp; Sally Jones</i>
Site Address, Tax#, Parcel # <i>781 Orange Blossom Ct., 400-99A-002</i>
<b>A. Description of Work</b> 1. Proposed Development Description: <input checked="" type="checkbox"/> New Construction <input type="checkbox"/> Dredging <input type="checkbox"/> Alteration or Repair <input type="checkbox"/> Manufactured/Modular <input checked="" type="checkbox"/> Filling <input type="checkbox"/> Logging <input type="checkbox"/> Grading <input type="checkbox"/> Other
<b>2. Size and Location of Development:</b> <i>single family (2,000 cu yds. fill); flood</i> <i>fringe of Dry river</i>
<b>3. Type of Construction</b> <input checked="" type="checkbox"/> New Residential <input type="checkbox"/> Improvement <input type="checkbox"/> New Non-Residential <input type="checkbox"/> Renovation <input type="checkbox"/> Addition <input type="checkbox"/> Accessory Structure <input type="checkbox"/> Temporary
Applicant's Signature <i>David M. Jones</i>

### Part of a sample Flood Zone Permit Application

(may vary by community)

#### Community Map and Elevation Data:

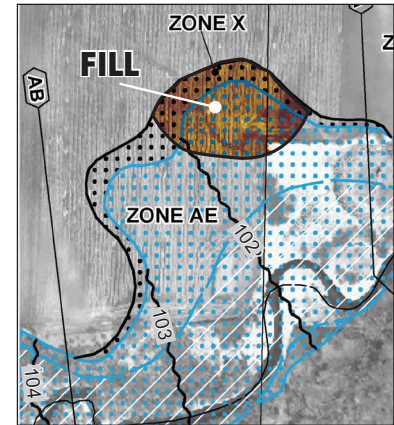
- Community No. 060243
- Panel No. 125C
- Zone AE
- Base Flood Elevation 102
- Floodway  Yes  No
- Required Lowest Floor Elevation (including basement) 104
- Elevation to which all attendant utilities, including all heating, duct work, and electrical equipment will be installed or floodproofed 104



Important

### Information

You must get all permits **before** you do work in a flood zone.



Good information will lead to better construction and less exposure to future flood damage.

## Communities Must Retain Flood Records Permanently

Communities that participate in the NFIP agree to maintain certain documentation for all development in flood zones, including:

- Permits issued and variances granted
- Floodway encroachment (no rise) and watercourse alteration
- Design certifications for buildings in Zone V and CAZ, including breakaway walls
- Design certifications for dry floodproofed nonresidential buildings
- Design certifications for engineered flood openings
- Determinations of whether work on existing buildings is substantial improvement or repair of substantial damage
- Surveyed “as-built” building elevations (Elevation Certificates)



**Important**

### **Information**

Maintaining permanent records allows communities to respond to citizen inquiries and to provide documentation to FEMA and the Department of Water Resources as part of Community Assistance Visits.



## What is the Elevation Certificate and How is it Used?

- The Elevation Certificate (EC) is a FEMA form. Go to [www.fema.gov](http://www.fema.gov) and search for “Elevation Certificate.”
- The EC must be completed and sealed by a California professional land surveyor or civil engineer.
- Community officials may complete the EC for sites in Approximate Zone A and Zone AO (see Section G of the EC).
- It can be used to show lowest grades adjacent to planned or existing building sites are above the base flood elevation and to support map changes ([see page 30](#)).
- It is used to verify building and equipment elevations.
- Insurance agents use the EC to write and rate NFIP flood insurance policies.
- [See page 84](#) for online Elevation Certificate training information

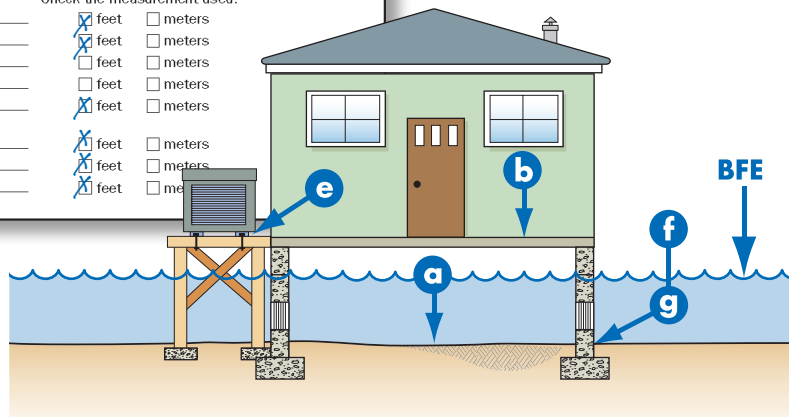
By itself, the EC cannot be used to waive the mortgage lender requirements to obtain flood insurance. [See page 26](#) to learn about FEMA’s Letter of Map Amendment process.

U.S. DEPARTMENT OF HOMELAND SECURITY Federal Emergency Management Agency National Flood Insurance Program		OMB No. 1660-0008 Expiration Date: November 30, 2022	
<b>ELEVATION CERTIFICATE</b> Important: Follow the instructions on pages 1-9.			
Copy all pages of this Elevation Certificate and all attachments for (1) community official, (2) insurance agent/company, and (3) building owner.			
<b>SECTION A - PROPERTY INFORMATION</b>		<b>FOR INSURANCE COMPANY USE</b>	
A1. Building Owner's Name	Policy Number:		
A2. Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.	Company NAIC Number:		
City	State	ZIP Code	
A3. Property Description (Lot and Block Numbers, Tax Parcel Number, Legal Description, etc.)			
A4. Building Use (e.g., Residential, Non-Residential, Addition, Accessory, etc.)			
A5. Latitude/Longitude: Lat: _____ Long: _____ Horizontal Datum: <input type="checkbox"/> NAD 1927 <input type="checkbox"/> NAD 1983			
A6. Attach at least 2 photographs of the building if the Certificate is being used to obtain flood insurance.			
A7. Building Diagram Number _____			
A8. For a building with a crawlspace or enclosure(s):			
a) Square footage of crawlspace or enclosure(s) _____ sq ft			
b) Number of permanent flood openings in the crawlspace or enclosure(s) within 1.0 foot above adjacent grade _____			
c) Total net area of flood openings in A8.b _____ sq in			
d) Engineered flood openings? <input type="checkbox"/> Yes <input type="checkbox"/> No			
A9. For a building with an attached garage:			
a) Square footage of attached garage _____ sq ft			
b) Number of permanent flood openings in the attached garage within 1.0 foot above adjacent grade _____			
c) Total net area of flood openings in A9.b _____ sq in			
d) Engineered flood openings? <input type="checkbox"/> Yes <input type="checkbox"/> No			
<b>SECTION B - FLOOD INSURANCE RATE MAP (FIRM) INFORMATION</b>			
B1. NFIP Community Name & Community Number		B2. County Name	B3. State
B4. Map/Panel Number	B5. Suffix	B6. FIRM Index Date	B7. FIRM Panel Effective/ Revised Date
B8. Flood Zone(s)	B9. Base Flood Elevation(s) (Zone AO, use Base Flood Depth)		
B10. Indicate the source of the Base Flood Elevation (BFE) data or base flood depth entered in Item B9: <input type="checkbox"/> FIS Profile <input type="checkbox"/> FIRM <input type="checkbox"/> Community Determined <input type="checkbox"/> Other/Source: _____			
B11. Indicate elevation datum used for BFE in Item B9: <input type="checkbox"/> NGVD 1929 <input type="checkbox"/> NAVD 1988 <input type="checkbox"/> Other/Source: _____			
B12. Is the building located in a Coastal Barrier Resources System (CBRS) area or Otherwise Protected Area (OPA)? <input type="checkbox"/> Yes <input type="checkbox"/> No Designation Date: _____ <input type="checkbox"/> CBRS <input type="checkbox"/> OPA			
FEMA Form 086-0-33 (12/19)		Replaces all previous editions.	
		Form Page 1 of 6	

## Completing the Elevation Certificate

## ELEVATION CERTIFICATE (partial)

SECTION C – BUILDING ELEVATION INFORMATION (SURVEY REQUIRED)	
C1. Building elevations are based on:	<input type="checkbox"/> Construction Drawings* <input type="checkbox"/> Building Under Construction* <input checked="" type="checkbox"/> Finished Construction *A new Elevation Certificate will be required when construction of the building is complete.
C2. Elevations – Zones A1–A30, AE, AH, A (with BFE), VE, V1–V30, V (with BFE), AR, AR/A, AR/AE, AR/A1–A30, AR/AH, AR/AO. Complete Items C2.a–h below according to the building diagram specified in Item A7. In Puerto Rico only, enter meters.	
Benchmark Utilized: _____	Vertical Datum: _____
Indicate elevation datum used for the elevations in items a) through h) below. <input type="checkbox"/> NGVD 1929 <input checked="" type="checkbox"/> NAVD 1988 <input type="checkbox"/> Other/Source: _____	
Datum used for building elevations must be the same as that used for the BFE.	
	Check the measurement used.
a) Top of bottom floor (including basement, crawlspace, or enclosure floor)	<input checked="" type="checkbox"/> feet <input type="checkbox"/> meters <input checked="" type="checkbox"/> feet <input type="checkbox"/> meters
b) Top of the next higher floor	<input type="checkbox"/> feet <input type="checkbox"/> meters <input type="checkbox"/> feet <input type="checkbox"/> meters
c) Bottom of the lowest horizontal structural member (V Zones only)	<input type="checkbox"/> feet <input type="checkbox"/> meters <input type="checkbox"/> feet <input type="checkbox"/> meters
d) Attached garage (top of slab)	<input checked="" type="checkbox"/> feet <input type="checkbox"/> meters <input type="checkbox"/> feet <input type="checkbox"/> meters
e) Lowest elevation of machinery or equipment servicing the building (Describe type of equipment and location in Comments)	<input checked="" type="checkbox"/> feet <input type="checkbox"/> meters <input type="checkbox"/> feet <input type="checkbox"/> meters <input checked="" type="checkbox"/> feet <input type="checkbox"/> meters
f) Lowest adjacent (finished) grade next to building (LAG)	<input type="checkbox"/> feet <input type="checkbox"/> meters <input type="checkbox"/> feet <input type="checkbox"/> meters
g) Highest adjacent (finished) grade next to building (HAG)	<input checked="" type="checkbox"/> feet <input type="checkbox"/> meters <input type="checkbox"/> feet <input type="checkbox"/> meters
h) Lowest adjacent grade at lowest elevation of deck or stairs, including structural support	<input type="checkbox"/> feet <input type="checkbox"/> meters <input type="checkbox"/> feet <input type="checkbox"/> meters

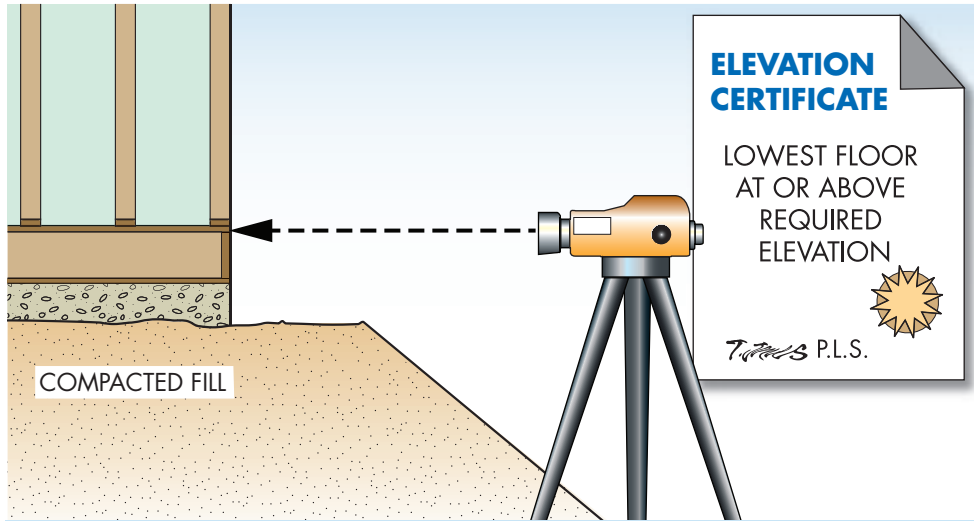


In this example, the BFE is 129.0 feet.

The house on crawlspace foundation (with flood openings) is elevated 2.5 feet above the BFE.

CCR Title 24 requires submission of elevation documentation two times, when the lowest floor is set and prior to further vertical construction and again prior to the final inspection. A licensed professional land surveyor or registered civil engineer must fill out and seal the EC form (except in zones without BFEs). The EC includes diagrams for different building types. Several points must be surveyed.

## Paperwork is Important for Owners



Important

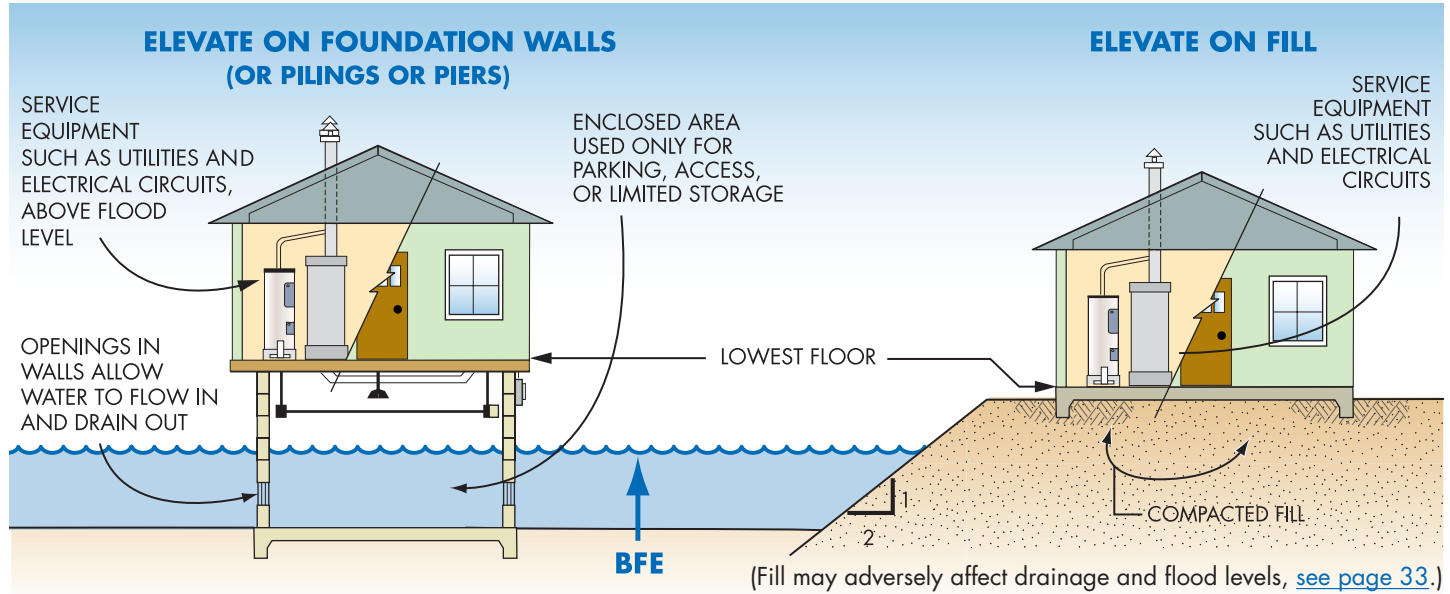
### Information

**Lowest Floor** means the lowest floor of the lowest enclosed area (including basement). An unfinished or flood-resistant enclosure (that is not a basement) is not the lowest floor if the enclosure is limited to parking, limited storage, and building access ([see pages 48 and 56](#)) and it is built as required in the California Building Standards Code.

Permittees must submit Elevation Certificates after the lowest floor (or lowest horizontal structural member) is placed and prior to further vertical construction. When construction is finished, another Elevation Certificate ("as-built") must be submitted prior to the final inspection.

Owners should keep Elevation Certificates in a safe place. They can be used to demonstrate buildings were compliant at the time of construction. Also, Elevation Certificates may be required to obtain federal flood insurance policies.

## How to Elevate Buildings in Flood Zone A/AE



**CAUTION!** Enclosures (including crawlspaces) have some special requirements ([see pages 48 and 49](#)).

Note: When the walking surface of the lowest floor is at the BFE, under-floor utilities are not allowed.

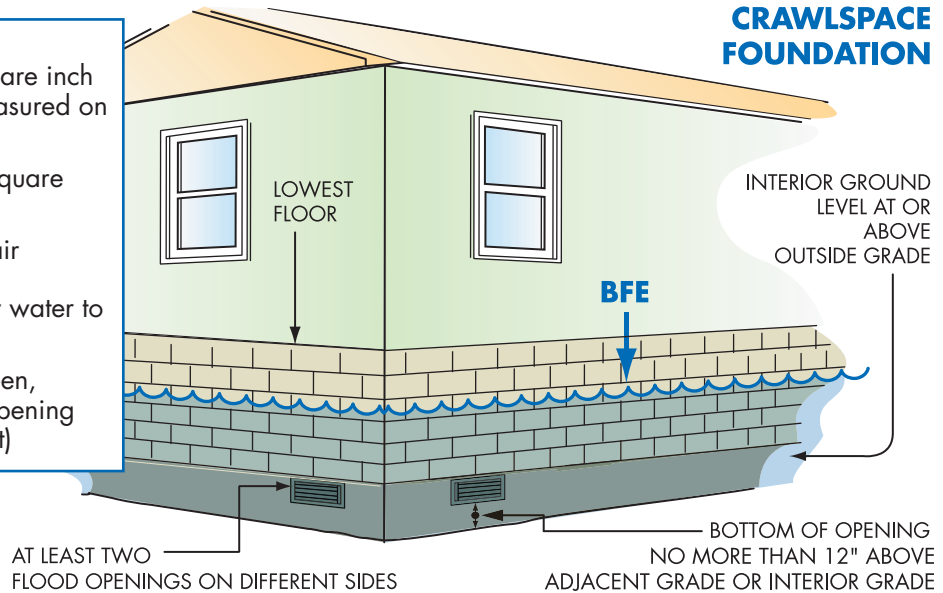
Fill used to elevate buildings must be placed properly ([see pages 33 and 50](#)).

## Enclosures Below the Lowest Floor (Zone A/AE)

### NOTE:

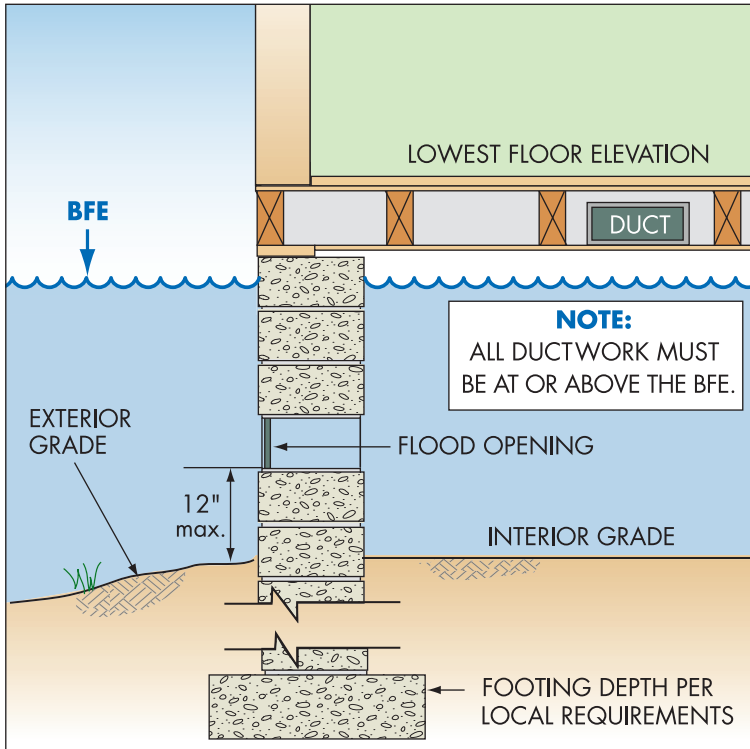
- Total net area of all openings is 1 square inch per square foot of enclosed area (measured on the outside)
- A 30' x 40' enclosure needs 1,200 square inches of openings
- If inserted in flood openings, typical air ventilation units must be permanently disabled in the open position to allow water to flow in and out
- A typical air ventilation unit, with screen, provides 42 to 65 square inches of opening (look for "net free area" stamp on unit)

**ALTERNATIVE:** Engineered openings are acceptable **if certified** to allow adequate automatic inflow and outflow of floodwater.



Solid perimeter wall foundations can enclose flood-prone space. A crawlspace is a good way to elevate just a couple of feet. The following are required: flood openings, elevated utilities, flood-resistant materials, and limitations on use. See NFIP Technical Bulletin #1 *Requirements for Flood Openings in Foundation Walls and Walls of Enclosures*.

## Enclosure Details (Zone A/AE)

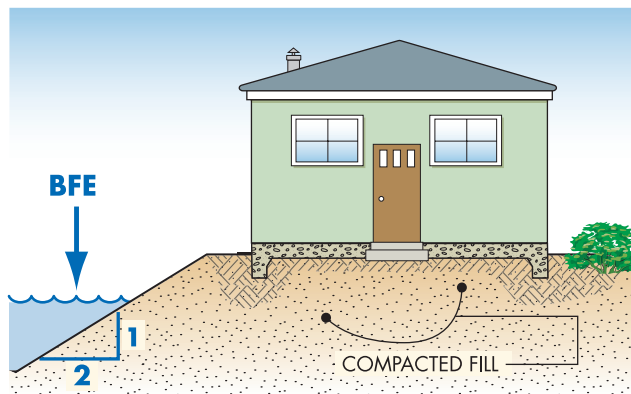


- CCR Title 24 requires the Lowest Floor at or above BFE plus 1 foot. DWR recommends another foot or more for greater protection.
- All materials below the lowest floor must be flood resistant.
- Flood openings must provide 1 square inch of net open area for every square foot of area enclosed by the perimeter walls – or certified engineered openings may be used.
- A 30' x 40' building needs 1,200 square inches of net opening (non-engineered).
- The bottom of flood openings must be no more than 12 inches above the higher of the interior or exterior grades.
- Standard air ventilation units must be permanently disabled in the “open” position to allow water to flow in and out.
- Interior grade must be equal to or higher than exterior grade on at least one side.

## Placement and Compaction of Fill in Zone A/AE

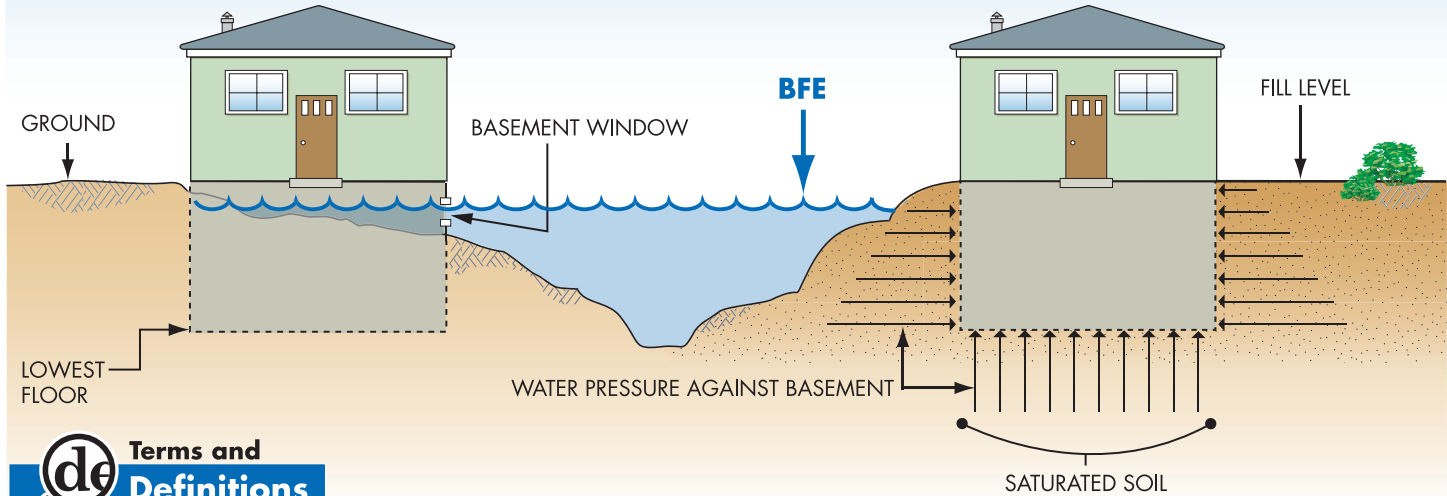
Earthen fill used to raise the ground above the flood elevation must be placed properly so that it does not erode or slump when water rises. For safety and to meet requirements, fill should:

- Not be placed in areas with poor drainage or where the fill may divert water onto adjacent properties. Instead, use perimeter walls, piers or pilings to minimize drainage problems.
- Be good clean soil, free of large rocks, construction debris, and woody material (stumps, roots)
- Be machine-compacted to 95 percent of the maximum density (determined by a design professional)
- Have graded side slopes that are not steeper than 2:1 (one foot vertical rise for every 2 feet horizontal extent); 3:1 flatter slopes are recommended
- Have slopes protected against erosion (vegetation for “low” velocities, durable materials for “high” velocities – determined by a design professional)
- Avoid the floodway ([see page 34](#))



Engineers can find more information in FEMA’s instructions for Letters of Map Revision based on Fill (FEMA Form MT-1) and NFIP Technical Bulletin #10.

## Basements in Flood Hazard Areas Are Unsafe



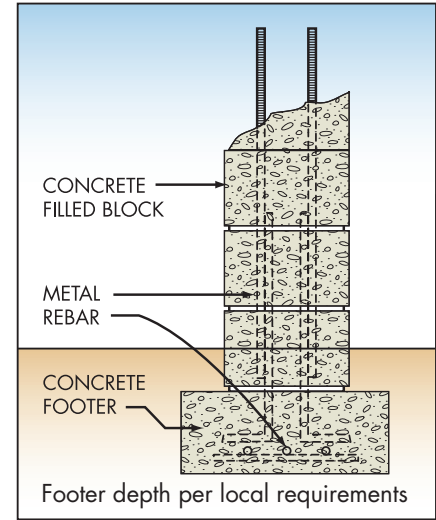
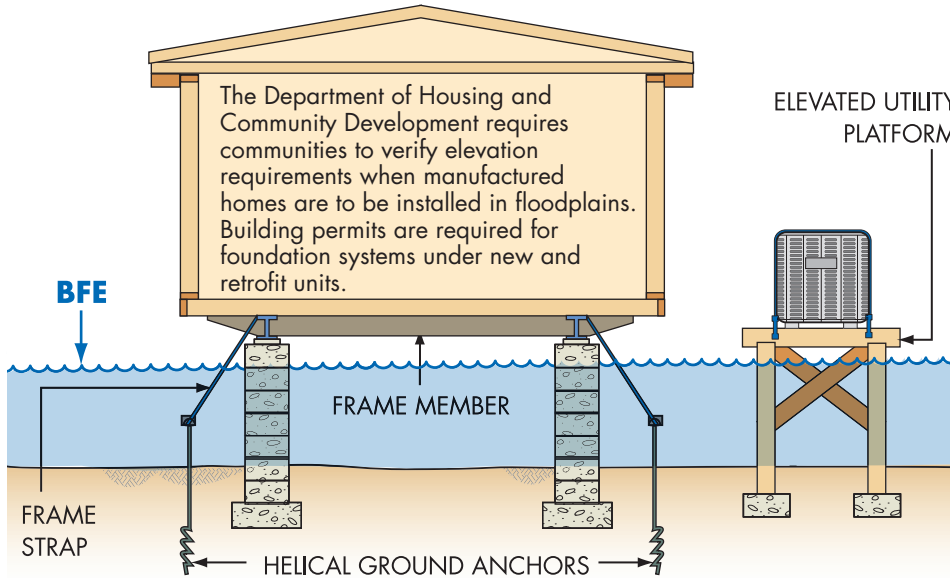
### Terms and Definitions

A **basement** is any portion of a building that has its floor sub-grade (below ground level) on all sides.

New buildings are not allowed to have basements below the BFE and federal flood insurance coverage is very limited in existing basements for a very good reason. It only takes an inch of water over a door threshold or window sill and the entire basement fills up! Excavating a basement into fill doesn't always make it safe because saturated groundwater can damage the walls.



## Manufactured Homes Require Special Attention




Experience shows that manufactured homes are easily damaged. Just a few inches of water above the floor can cause substantial damage.

Homes must be anchored to reinforced foundations to resist flotation, collapse, and lateral movement and must be tied down in accordance with community ordinances or the manufacturers' installation specifications for SFHAs. See guidance and some pre-engineered designs in FEMA P-85, *Protecting Manufactured Homes from Floods and Other Hazards*.

## General Requirements in Coastal High Hazard Areas (Zone V)

The fundamental requirements for flood resistant construction ([see page 37](#)) apply in Zone V and:

- Building foundations must be “open” (columns and pilings) to allow waves and water to pass under without imposing significant wave forces ([see page 54](#)).
- The lowest horizontal structural member of the lowest floor must be elevated at or above the BFE + 1 foot ([see page 54](#)).
- Foundation designs must be prepared and certified by registered design professionals ([see pages 55](#) and [57](#)).
- Walls of enclosures below elevated buildings must be designed to break away ([see page 56](#)).

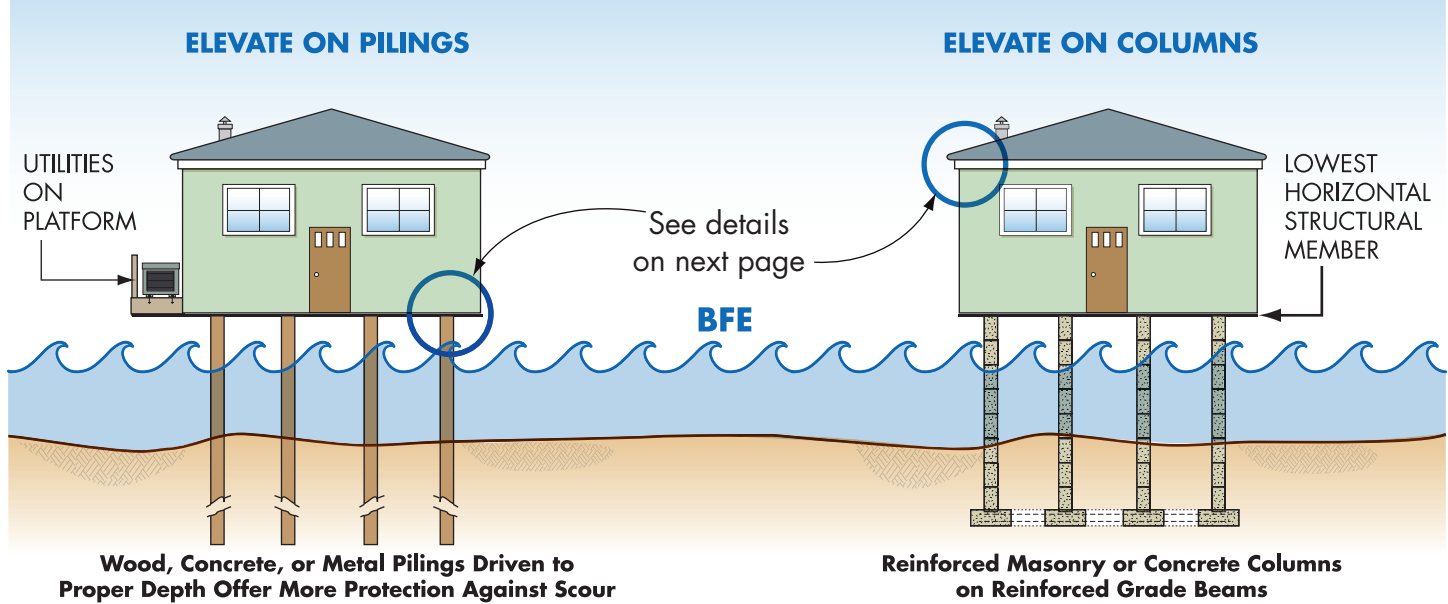


**Terms and Definitions**

**Coastal High Hazard Areas (Zone V)** are shown on FIRMs to identify areas subject to high velocity wave action during base flood conditions. In Zone V, waves may be 3 feet high or higher.

Some Zone AE areas inland of Zone V may be subject to damaging waves and erosion. DWR recommends buildings in these areas be designed and constructed according to the Zone V requirements.

## How to Elevate Buildings in Flood Zone V and CAZ

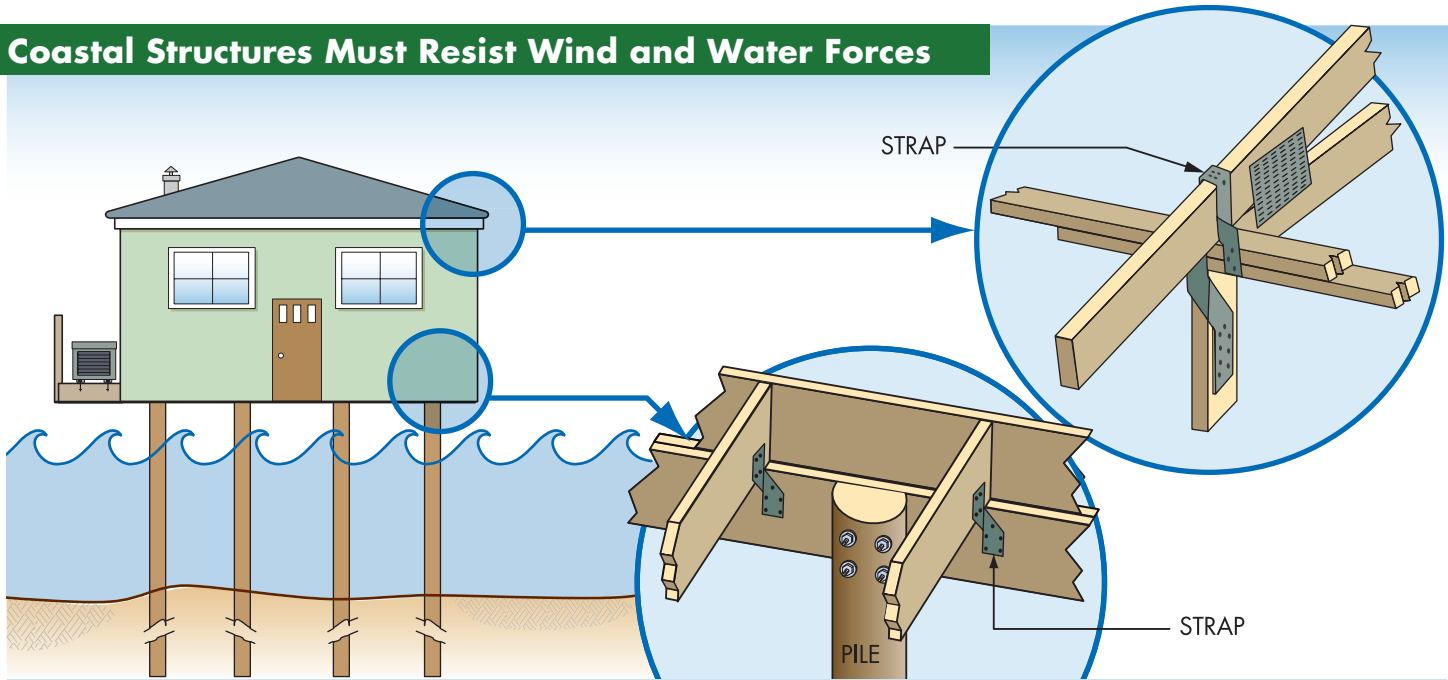


In Zone V and CAZ, the design specifics will be determined by an architect or engineer based on the site, including how the building will be elevated and how deep the foundation elements will be in the ground.

A *Zone V Design Certificate* or statement will be required ([see page 57](#)).

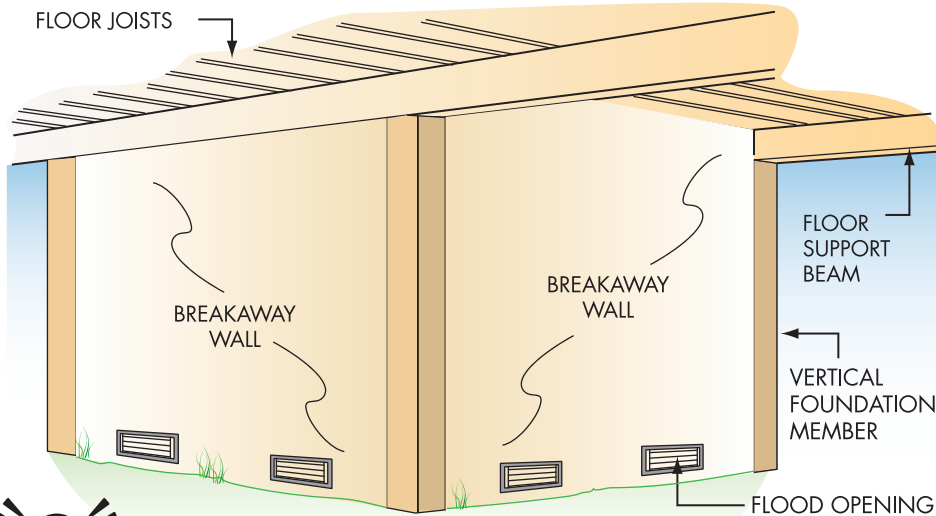
For more information, see FEMA P-55, *Coastal Construction Manual*.

## Coastal Structures Must Resist Wind and Water Forces



Coastal buildings may be exposed to high winds, waves, and floodwater. Structural building components must be connected together to transfer forces in a continuous load path from the roof to the foundation and the ground. The details above are some examples of how this is done. An architect or engineer must determine the types of connections required for the roof, building, and foundation.

## Enclosures Below Zone V and CAZ Buildings



### Important

### Information

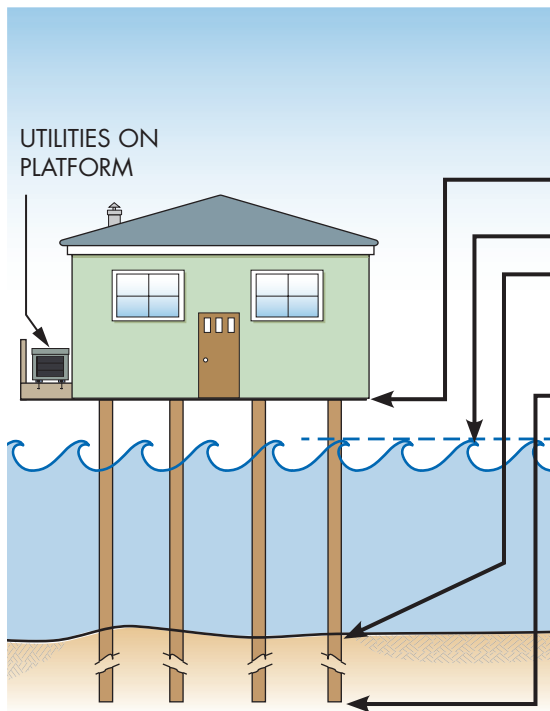
It is a violation if enclosures below elevated buildings are modified or used for purposes other than parking, storage, and access. Not only will damage be increased during floods, but NFIP flood insurance policies will be more expensive.

Enclosures under elevated buildings should be avoided. If small areas are enclosed:

- Walls must be designed to collapse or “break away” under flood conditions and have flood openings
- Enclosures must be unfinished and made of flood resistant materials
- Utility wires and pipes must not go through or be attached to breakaway walls
- Enclosures must be used only for parking, limited storage, and building access (no bathrooms, recreation, or utility rooms)
- Minimal electric service for safety (light switch)

Enclosures larger than 299 square feet may have higher insurance premiums.

## The Zone V and CAZ Design Certificate



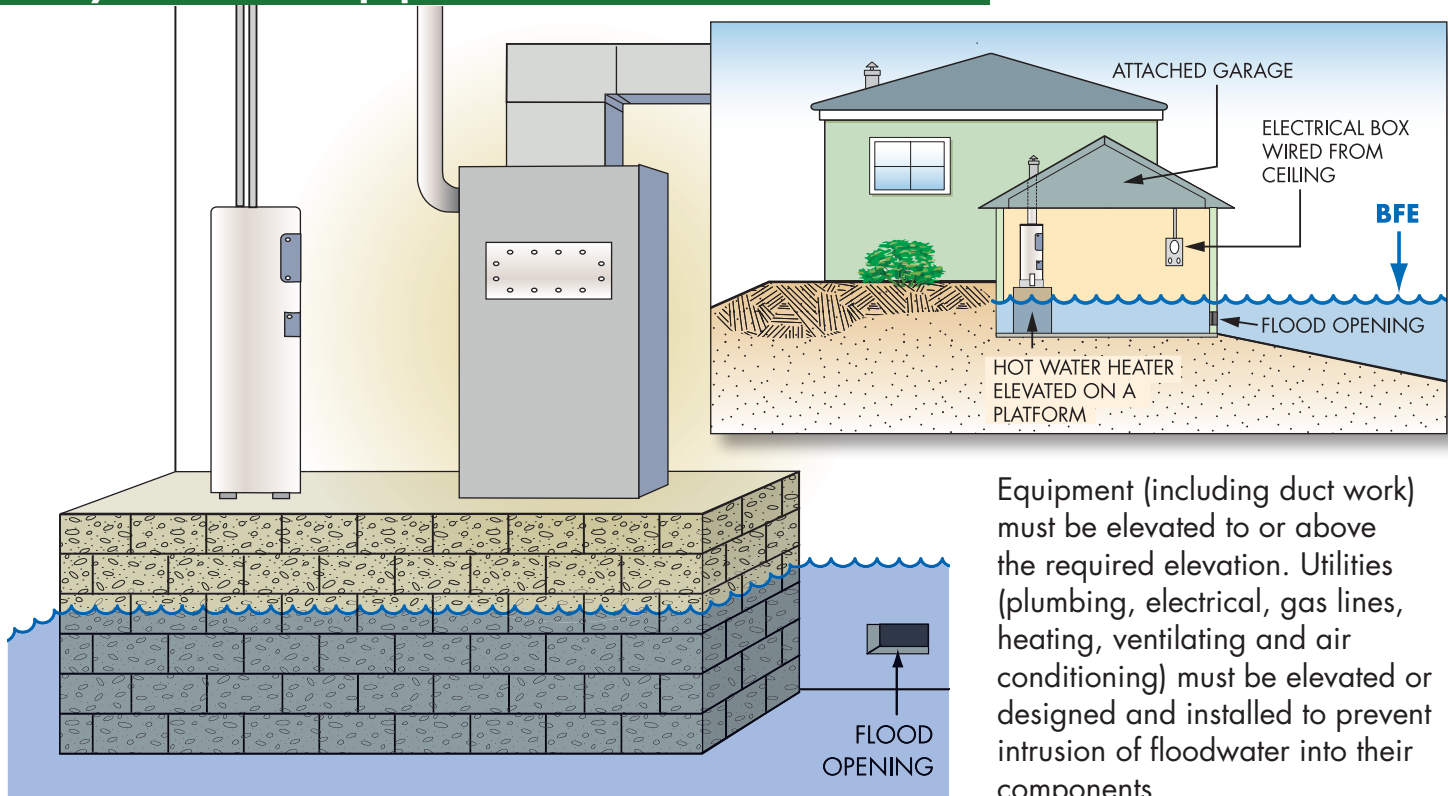
### ZONE V and CAZ DESIGN CERTIFICATE (Partial)

#### SECTION II: Elevation Information Used for Design

- |   |  |                               |  |                                |
|---|--|-------------------------------|--|--------------------------------|
| 1 | Datum.....   | <input type="checkbox"/> NGVD | <input checked="" type="checkbox"/> NAVD | <input type="checkbox"/> Other |
| 2 | Elevation of the Bottom of Lowest Horizontal Structural Member .....           |                               | 14                                       | feet above datum               |
| 3 | Base Flood Elevation (BFE).....  |                               | 12                                       | feet above datum               |
| 4 | Elevation of Lowest Adjacent Grade .....                                       |                               | 6  | feet above datum               |
| 5 | Approximate Depth of Anticipated Scour/Erosion used for Foundation Design..... |                               | 3  | feet                           |
| 6 | Embedment Depth of Pilings or Foundation Below Lowest Adjacent Grade.....      |                               | 16                                       | feet                           |

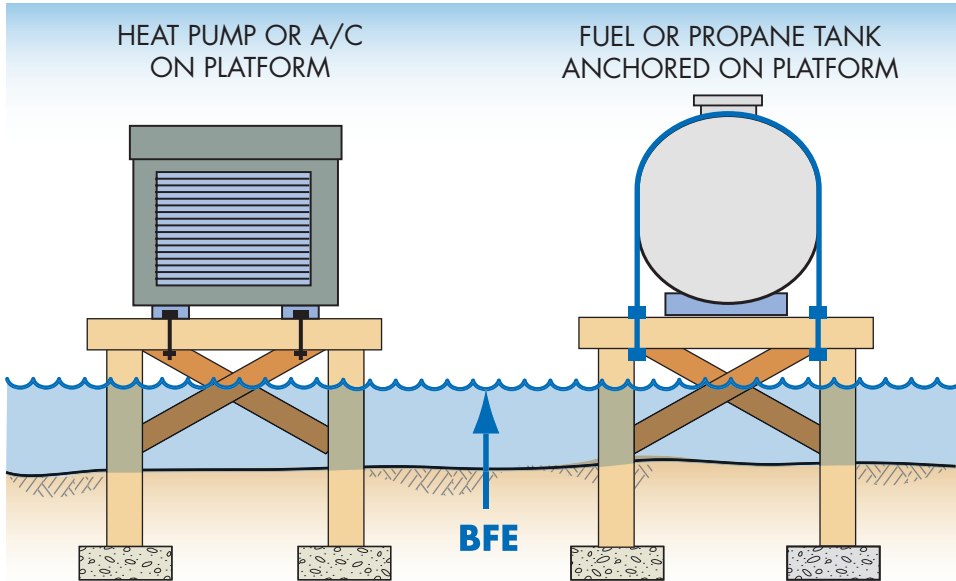
A California licensed engineer or architect must review and/or prepare the building design and complete a *Zone V and CAZ Design Certificate* for any new construction, substantial improvement, or the repair of a substantially damaged structure. An "as-built" Elevation Certificate is required when construction is completed.

## Utility Service and Equipment Inside Enclosures



Equipment (including duct work) must be elevated to or above the required elevation. Utilities (plumbing, electrical, gas lines, heating, ventilating and air conditioning) must be elevated or designed and installed to prevent intrusion of floodwater into their components.

## Utility Service, Equipment, and Tanks



Important

### Information

Fuel and propane tanks may explode or release contents during flooding. Even shallow water can create large buoyant forces on tanks. In all flood zones tanks may be underground or elevated on platforms or columns. In Zone A/AE only, tanks may be at-grade and anchored to resist flood loads.

CCR Title 24 has requirements for tanks in ASCE 24 and in R322.2.4 (Zone A) and R322.3.3.7 (Zone V and CAZ).

Whether inside an attached garage or outside the building, all utilities and equipment must be elevated above required elevation or protected against flood damage. Utilities include plumbing, electrical components, gas lines, tanks, and heating and air conditioning equipment.



## Pools in Flood Hazard Areas

The type of flood zone and whether a pool is in-ground, above-ground, or a combination (perhaps with associated grading and fill) determine which requirements apply. All pools should be installed to be stable under flood conditions, including scour and erosion.

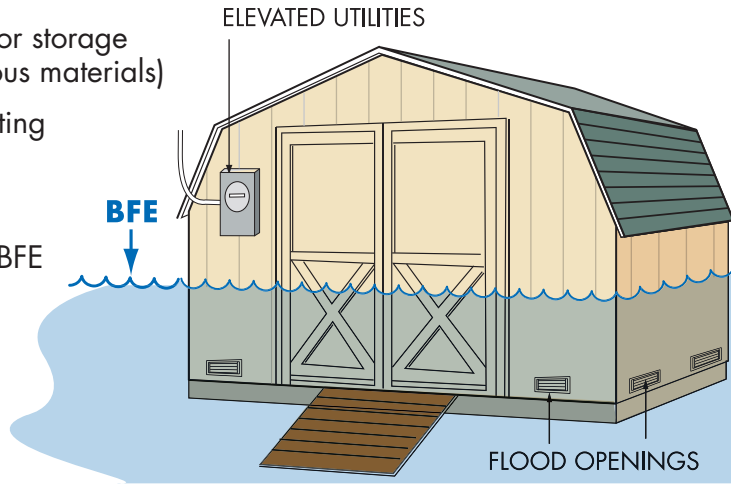
- **Pools in flood Zone A/AE.** When above-ground pools and pools installed with fill are located in floodways and in riverine flood hazard areas where BFEs are specified but floodways have not been designated, the floodway encroachment requirements apply ([see page 34](#)).
- **Pools in flood Zone V and CAZ.** Pools in these flood hazard areas should be designed in accordance with ASCE 24. Pools located near or under buildings should be in-ground and pool decks should be flush with original grade to avoid being obstructions that could divert floodwater and waves toward buildings.
- **Public swimming pools and other private pools.** Pools located under buildings must not be enclosed by walls (enclosures under elevated buildings must be used only for parking, storage, and building access. Free-standing pools may be installed in dry floodproofed buildings.
- **Pool controls and equipment.** Requirements for utility service apply ([see page 59](#)).

For guidance on pools in Zone V and CAZ, see NFIP Technical Bulletin 5 *Free-of-Obstruction Requirements* and FEMA P-499 *Home Builders Guide to Coastal Construction*.

## Accessory Structures

If not elevated, accessory structures in flood zones must:

- Not be habitable
- Be used only for parking or storage (not pollutants or hazardous materials)
- Be anchored to resist floating
- Have flood openings
- Be built of flood damage-resistant materials below BFE
- Have elevated utilities below BFE
- Not be modified for different use in the future



## Terms and Definitions

### Accessory Structure

is a structure that is accessory to and incidental to that of a primary structure located on the same lot that is either:

1. Solely for the parking of no more than two vehicles.
2. A storage shed that is less than 150 square feet in size.

Even small buildings are “development” and permits or variances with noted conditions are required. They must be elevated or anchored and built to withstand flood damage.

**Caution!** Remember, everything inside will get wet when flooding occurs.

## Agricultural Structures

Communities may adopt regulations to grant variances to allow certain agricultural structures to be “wet floodproofed” rather than elevated or dry floodproofed. FEMA specifies:

- Variances must be granted for individual agricultural structures
- Applicants must justify variances, including low damage potential and the anticipated hardship if variances are not granted
- Except for size limits, the accessory structure requirements also apply to agricultural structures ([see page 61](#))

As an alternative to handling individual agricultural structures by variance, communities may seek a “community-wide exception” from FEMA. If approved, the exception allows communities to issue permits under specified conditions.

FEMA issued a policy on agricultural structures and accessory structures in early 2020. The policy, a floodplain management bulletin, and fact sheets are available on FEMA's web site. Contact [DWR\\_NFIP@water.ca.gov](mailto:DWR_NFIP@water.ca.gov) with questions.



Important

### Information

**Agricultural Structure** is defined by FEMA policy as a structure that is used exclusively in connection with the production, harvesting, storage, raising, or drying of agricultural commodities and livestock. Aquaculture is farming conducted in or over water. Structures used for human habitation are not agricultural structures, even when located on agricultural land.

## Recreational Vehicles and Park Trailers

In flood hazard areas, RVs and park trailers must:

- Be licensed and titled as an RV or park trailer (not as a permanent residence)
- Be built on a single chassis
- Must measure 400 square feet or less (measured at largest horizontal projection)
- Have inflated tires and be self-propelled or towable by a light-duty truck
- Have no attached deck, porch, shed, or utilities
- Be used for temporary recreational, camping, travel or seasonal use (no more than 180 consecutive days)
- Have quick-disconnect sewage, water and electrical connectors



**Important**

**Information**

### **Camping near the water?**

Ask the campground or RV park operator about flood warnings and plans for safe evacuations.

RVs and park trailers that do not meet these conditions must be installed and elevated like manufactured homes, including permanent foundations and tie-downs ([see page 52](#)).

## Improvements and Repairs of Buildings in Flood Zones

Permits to improve and repair buildings are required. Local officials must:

- Review costs estimated in construction contracts or other cost estimates (including estimate market value of owner labor and donated labor and materials).
- Estimate the market value using property assessment records or use an independent assessment of market value performed by a licensed appraiser.
- Compare the cost of improvements and repairs to the market value of the building.
- Require buildings to be brought into full compliance if the improvement costs equal or exceed 50% of the market value, called Substantial Improvement.
- Require damaged buildings to be brought into full compliance if the costs to repair to pre-damage condition equal or exceed 50% of the market value, called Substantial Damage
- Encourage owners to consider other ways to reduce future damage if the comparison is less than 50% ([see page 76](#)).



**Important**

### Information

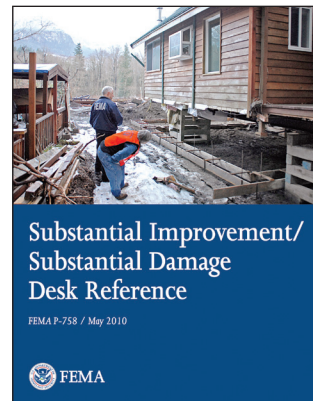
Improvements include:

- Renovation/rehabilitation of the interior of the existing building ([see page 69](#))
- Lateral addition, without renovation or structural alteration of the existing building ([see page 70](#))
- Lateral addition, with renovation or structural alteration of the existing building ([see page 71](#))
- Vertical addition (add new story)

## Substantial Improvement/Substantial Damage Desk Reference

FEMA's SI/SD Desk Reference (FEMA P-758) provides guidance and suggested procedures for:

- Estimating costs of improvements and costs of repairs ([see page 66](#))
- Estimating market values
- Community and property owner responsibilities
- Administrative requirements
- Key aspects of bringing buildings into compliance
- Suggestions for preparing for disasters



<https://www.fema.gov/media-library/assets/documents/18562>

### Terms and Definitions

**Substantial Improvement** means any reconstruction, rehabilitation, alteration addition, or other improvement of a structure, the cost of which equals or exceeds 50% of the market value of the structure before the start of construction of the improvement. This term includes structures which have incurred “substantial damage” from any cause (flood, fire, hurricanes, tornadoes, etc.), regardless of the actual repair work performed ([see page 74](#)). Some California communities track improvements over a period of time and trigger compliance when the cumulative improvement value equals or exceeds 50%.

## Estimating Costs of Improvements and Repairs

The costs of improvements (or the costs to repair damaged buildings to pre-damage condition) must be estimated before determining whether proposed work constitutes Substantial Improvement or repair of Substantial Damage.

- **Include** costs of all structural elements, all interior and exterior finishes, built-in appliances, all utility and service equipment
- **Include** site preparation related to the improvement or repair (e.g., foundation excavation or filling in basements)
- **Include** costs of demolition, construction management, contractor overhead and profit
- **Include** costs associated with elevating a structure when the proposed elevation is lower than the BFE + 1 foot
- **Exclude** costs of plans and specifications, land survey, permit and inspection fees, and debris removal
- **Exclude** costs of outside improvements (landscaping, irrigation, sidewalks, driveways, fences, yard lights, pools, detached accessory structures, etc.)

For more details on cost items that must be included and those that are excluded, see the SI/SD Desk Reference ([see page 65](#)).



Important

### Information

Written estimates prepared by contractors provide the best cost information.

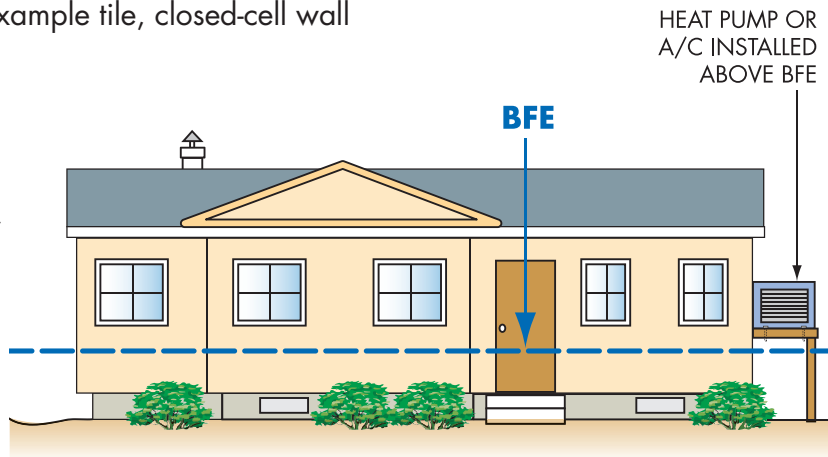
Owners performing work must include estimates of the value of their own labor.

Equivalent costs must be estimated when materials are donated or volunteers help with construction.

## Non-Substantial Improvements Other than Additions

Proposed improvements are “non-substantial” if the costs are less than 50% of the market value of the building. In these cases, buildings are not required to be brought into compliance. However, there are many things owners can do to reduce exposure to future flooding. Owners should consider the following:

- Use flood damage-resistant materials, for example tile, closed-cell wall insulation, and polyvinyl wall coverings
- Raise air conditioning equipment, heat pumps, furnaces, water heaters, and other appliances on platforms
- Move electric outlets higher above the floor
- Add flood openings to crawlspace foundations
- Move ductwork out of crawlspaces
- Fill in below-grade crawlspace



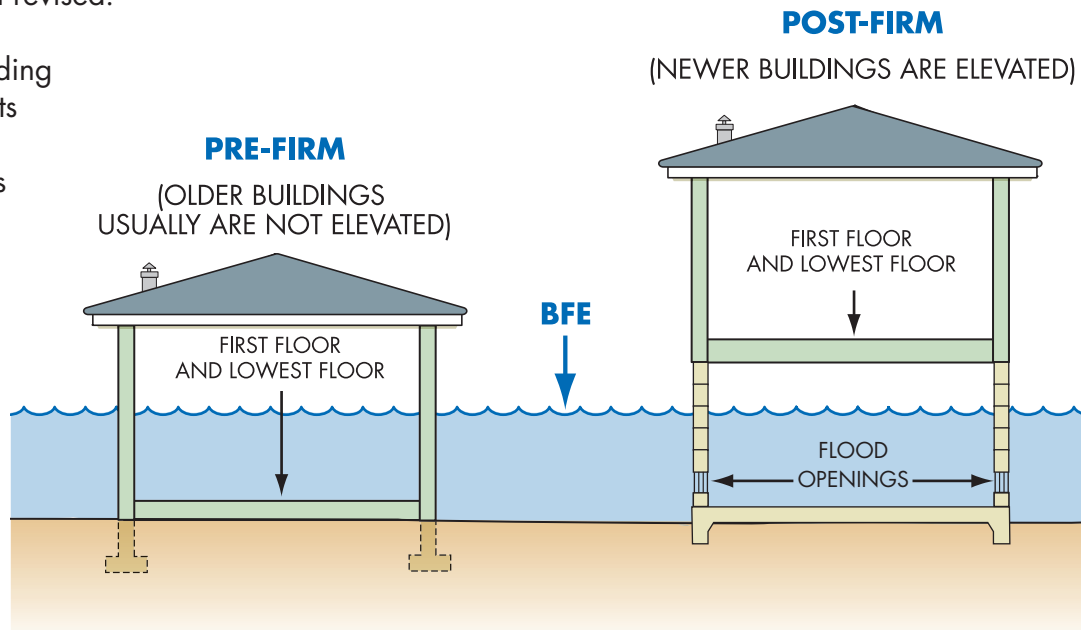
**Note!** ALL proposed work must be included in permit applications. If more work is proposed or undertaken after a permit is issued, community officials must determine whether the additional work changes the substantial improvement determination.



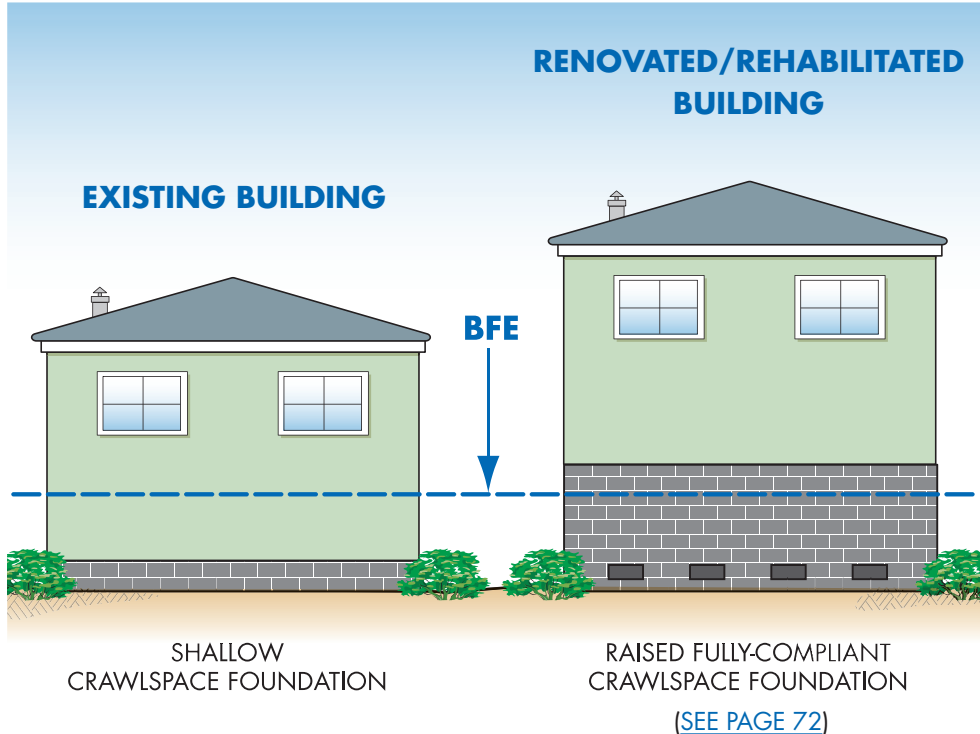
## What is Meant by Pre-FIRM and Post-FIRM?

**Pre-FIRM** and **Post-FIRM** are insurance terms tied to a community's initial FIRM. The terms are used to determine flood insurance rates. Although common, the terms should not be used to distinguish between new construction built before a community joined the NFIP and those built after, especially in communities where the FIRMs have been revised.

The California Existing Building Code specifies when permits are required for work on existing buildings. Buildings must be brought into compliance when work is determined to be substantial improvement or repair of substantial damage.



## Substantial Improvement: Renovation Only



**Important**

### Information

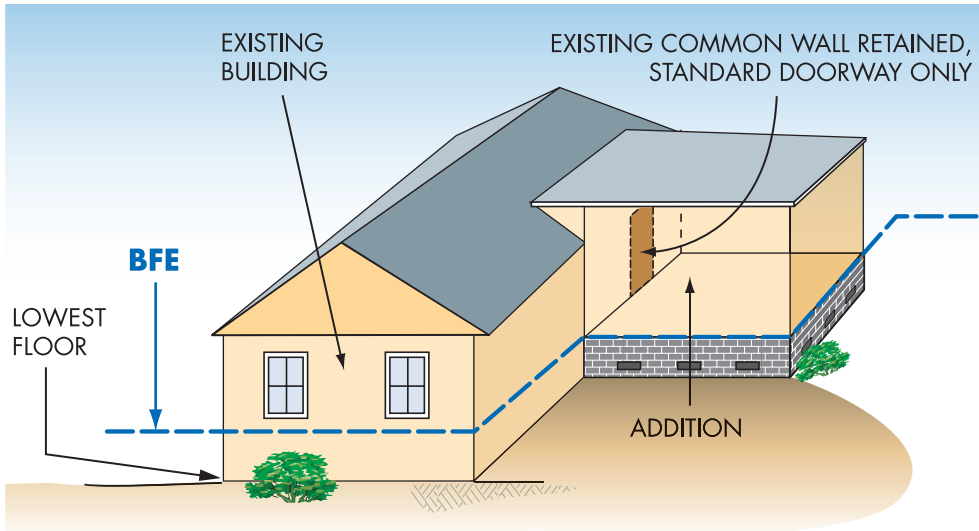
Floodplain buildings can be improved, renovated, rehabilitated or altered, but special rules apply.

Consult local permit offices before beginning work. Provide complete information about all proposed work.

If local code officials have cited violations of State or local health, sanitary, or safety codes, minimum costs to correct violations to provide safe living conditions can be excluded from the cost of renovations.

Alteration of registered historic structures are allowed, by variance, as long as the structures continue to meet the criteria for listing as historic structures.

## Substantial Improvement: Lateral Addition Only



**Important**

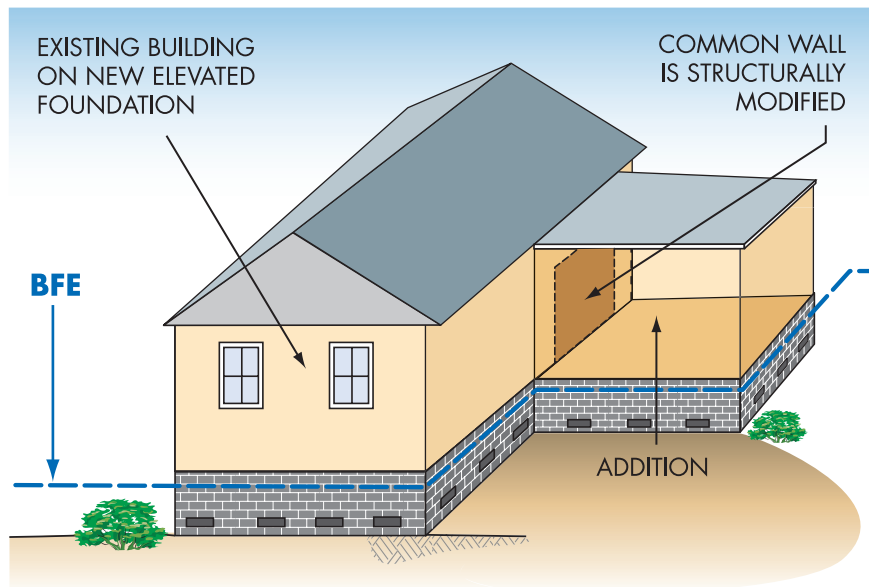
### Information

See [page 71](#) for projects to add lateral additions that also modify the interior of the existing building or make structural modifications to the existing common wall.

Permits are required to build additions to buildings in flood zones. Only the addition must be elevated and comply with the building code and floodplain management requirements, provided:

- There are no other modifications to the existing building, and
- There are no structural modifications to the existing common wall other than adding a standard 36" doorway

## Substantial Improvement: Addition Plus Other Work

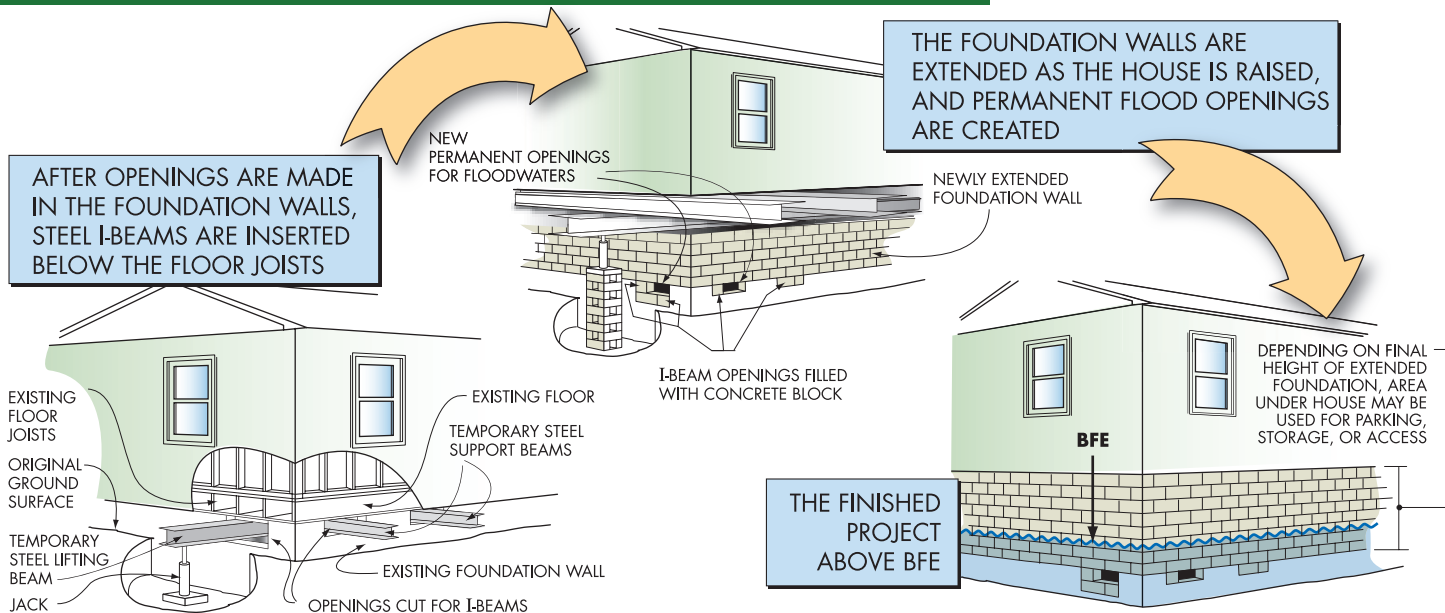


Communities must prepare evaluations to determine if all proposed work will trigger the substantial improvement requirement. Substantial improvement is triggered if:

- The work involves adding a new top floor, modifying the interior of the existing building, or structural modifications to the existing common wall (for lateral addition); and
- The cost of all proposed work plus the cost of improvements equals or exceeds 50% of the market value of the existing building.

Community permit offices can help determine which requirements apply when buildings must be brought into compliance. A preliminary review of proposed improvements is recommended before projects are designed and before permit applications are submitted.

## Elevating an Existing Building



This is one way to elevate an existing building to comply with building code and floodplain regulations (also see FEMA P-312, *Homeowner's Guide to Retrofitting*). If an NFIP-insured building is damaged by flood and the community determines it is substantially damaged, the owner may be eligible for an **Increased Cost of Compliance** payment ([see page 75](#)).

## Estimating Substantial Damage



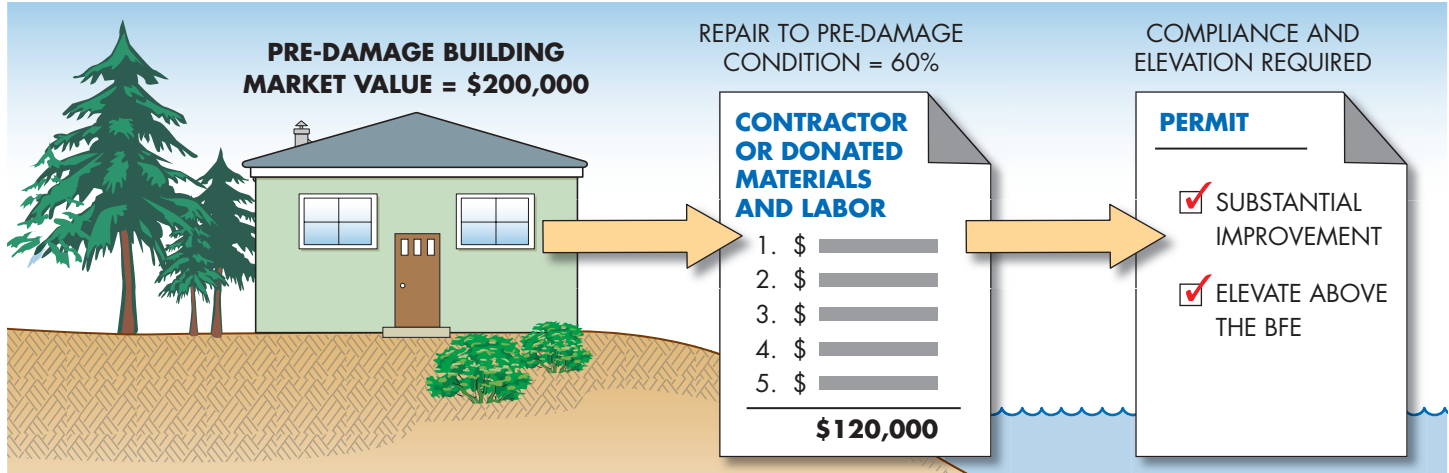
FEMA's Substantial Damage Estimator tool (SDE) was developed to help state and local officials in collecting uniform information needed to make substantial damage determinations for residential and non-residential structures in accordance with local floodplain management requirements.

The SDE tool:

- Can be used to assess flood, wind, wildfire, seismic, and other forms of damage
- Helps provide timely substantial damage determinations so that reconstruction can begin following events that damage buildings
- Is used in conjunction with industry-accepted construction cost-estimating guides

Download the SDE software installation package, *User Manual and Field Workbook*, forms, worksheets and other materials at <https://www.fema.gov/media-library/assets/documents/18692>.

# Repair of Damaged Buildings



Permits are required to repair damaged buildings, regardless of the cause – fire, flood, wind, or even vehicle impact. Detailed estimates of the cost to repair a building to pre-damage condition are required. If the costs are 50% or more of the pre-damage market value of the building, then it is “substantially damaged” and must be brought into compliance, which may involve raising the foundation and other measures. Consult with local permit offices before repairs are started.

[See page 72](#) for an example of elevating an existing building above a crawlspace.

## Paying for Post-Flood Compliance

Owners may be eligible for up to \$30,000 (as of 2019) to help pay to bring buildings into compliance with building code and community requirements – if all of the following apply:

- Buildings are located in a special flood hazard area
- Buildings are covered by federal flood insurance, which includes Increased Cost of Compliance (ICC) coverage
- Buildings have lowest floors below the community's required elevation
- The community determined buildings were substantially damaged
- Insurance claims adjusters confirm substantial damage caused by flooding
- Owners act quickly with their claims adjusters and community officials to process all required paperwork

Learn more at [www.fema.gov/increased-cost-compliance-coverage](http://www.fema.gov/increased-cost-compliance-coverage).

Owners whose buildings are substantially damaged are required to “bring the building into compliance” with flood zone requirements. Substantial damage is a special case of substantial improvement.

### USE THE ICC CLAIM TO:



ELEVATE-IN-PLACE



RELOCATE TO  
HIGH GROUND



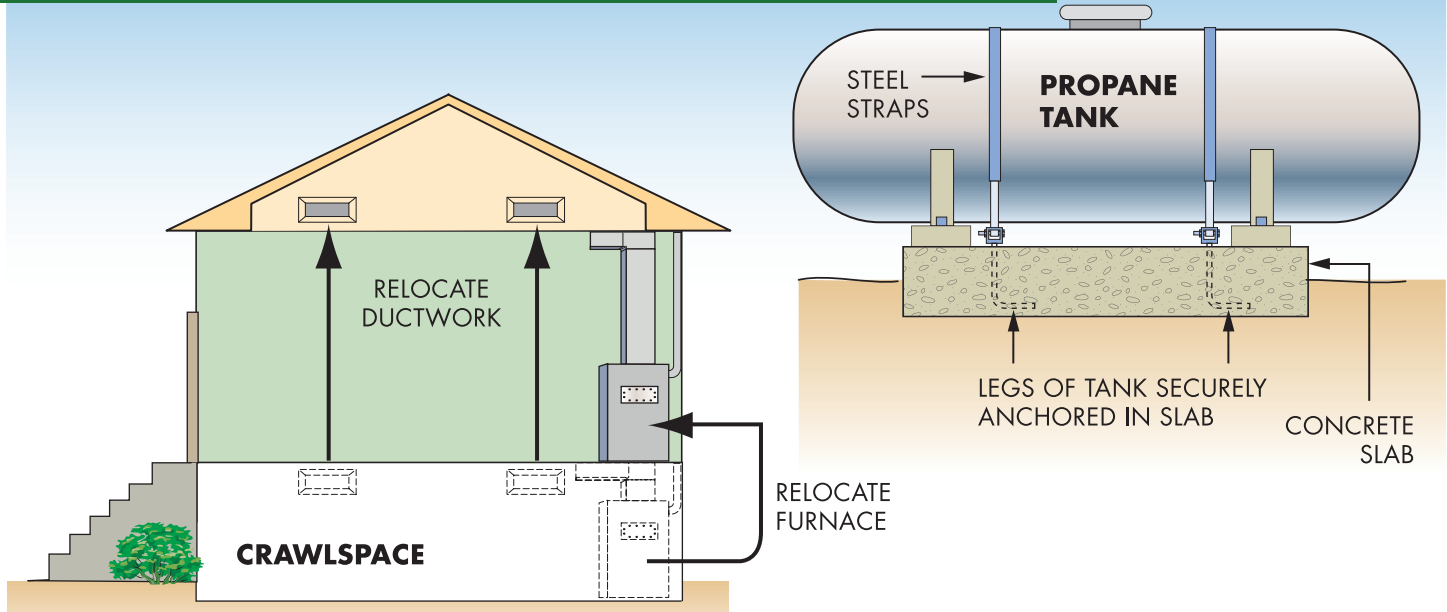
DEMOLISH



FLOODPROOF  
(NON-  
RESIDENTIAL  
ONLY)

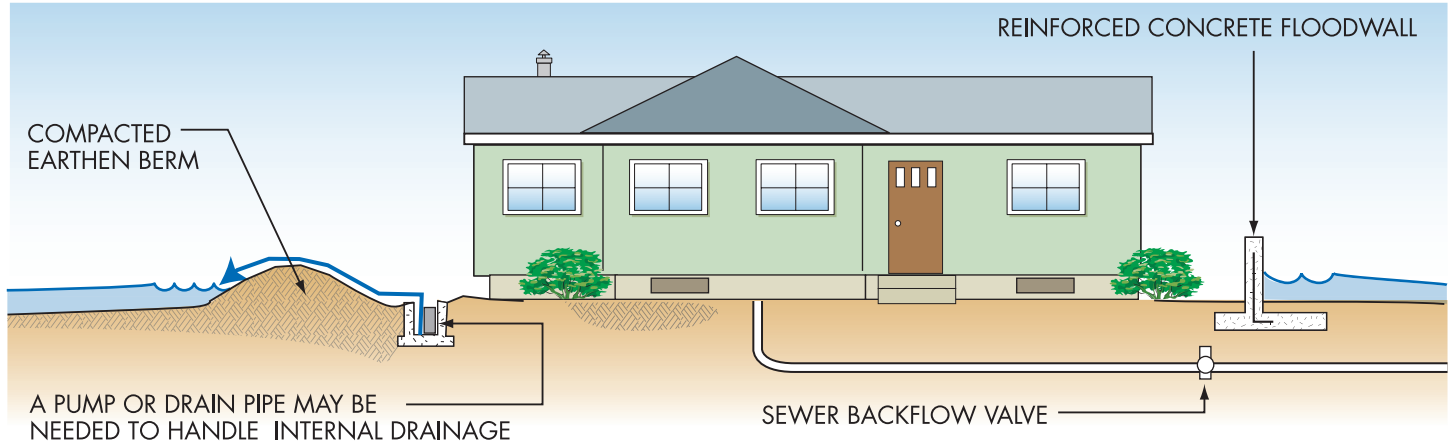


## Some Flood Protection for Older Homes is Easy and Low Cost



Move fuse boxes, water heaters, furnaces, and ductwork out of crawlspaces and basements.  
Anchor heating oil and propane gas tanks to prevent flotation and lateral movement.  
**Do not** store valuables or hazardous materials in a flood-prone crawlspace or basement.  
Use water-resistant materials when repairs are made.

## Small Berms or Floodwalls May Protect Older Buildings



In areas where floodwater isn't expected to be deep, sometimes individual buildings can be protected by earthen berms or concrete floodwalls. Permits are required for these protection measures and extra care must be taken if sites are in floodways ([see page 15](#)). Small berms or floodwalls cannot be used to achieve compliance for new construction, substantially improved buildings, or substantially damaged buildings.

**Important!** These protective measures will not reduce your flood insurance premium!

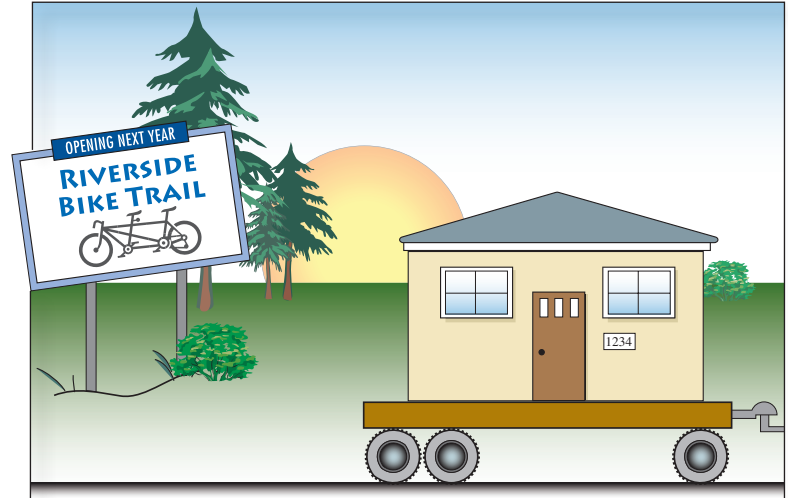
## Some Flood Mitigation Projects are More Costly Up Front

### But Give More Protection and a Positive Return on Investment

Following floods, some communities purchase and remove damaged homes. The acquired land is dedicated to public open space or stormwater storage and can be used for recreation or to help restore wildlife habitat and wetlands.

Some homes have been elevated on new, higher foundations, and others have been moved to safer high ground outside of high risk flood hazard areas.

Studies indicate these types of projects have a 7:1 return on investment.



The Governor's Office of Emergency Services administers pre- and post-disaster mitigation grants and works with communities to develop hazard mitigation plans: <https://www.caloes.ca.gov/>

## Central Valley Flood Protection Board

The Central Valley Flood Protection Board (CVFPB) is the State regulatory agency responsible for ensuring that appropriate standards are met for the construction, maintenance, and protection of the flood control system that protects life, property, and wildlife habitat in California's vast and diverse Central Valley (Sacramento and San Joaquin river basins) from the devastating effects of flooding. CVFPB keeps watch over the Central Valley's continually improving flood management system.



CVFPB encroachment permits are required for the placement, construction, reconstruction, removal, or abandonment of any landscaping, culvert, bridge, conduit, fence, projection, fill, embankment, building, structure, obstruction, encroachment or works of any kind, and including the planting, excavation, or removal of vegetation, and any repair or maintenance that involves cutting into the levee, wholly or in part within any area for which there is an Adopted Plan of Flood Control, within 300 feet of a Designated Floodway, or within 30 feet of a CVFPB regulated stream.

Visit <http://cvfpb.ca.gov/profiles-maps/> to view drainage district jurisdiction maps; the boundaries of federal and private levees, designated floodways, and regulated streams; channel design profiles; and maps with overlays of local maintaining entities.

## CCR Title 24 Appendices: Optional Requirements for Certain Residential Buildings

Building Code Appendix K and Residential Code Appendix W specify requirements for Group R-3 and Group R-3.1 occupancies protected by the facilities of the State Plan of Flood Control where flood levels are anticipated to exceed three feet for the 200-year flood event. The primary objectives are to provide for structural stability of and evacuation from specific residential buildings.

When communities elect to adopt one or both of the appendices, evacuation locations in those buildings:

- Must be not less than 1 foot above the water surface elevation of the 200-year flood
- Must meet minimum sizes based on occupant load
- Must either have windows that meet minimum size and dimensions; exterior doors to decks, balconies and porches; or a means of escape to rooftops

Areas subject to these requirements are identified by DWR. These areas are found in Butte, Colusa, Fresno, Glenn, Lake, Madera, Merced, Plumas, Sacramento, San Joaquin, Solano, Stanislaus, Sutter, Tehama, Yolo and Yuba counties (determination of additional facilities is ongoing).

View the appendices at <https://water.ca.gov/nfip/> (Building Codes).



**Important**

### Information

Group R-3 and Group R-3.1 occupancies are defined in the CBC.

In general:

- R-3 includes congregate residences, boarding houses, dormitories, fraternities and sororities
- R-3.1 includes certain licensed care and residential facilities

## Turn Around Don't Drown®

Learn about flood risks and follow these safety rules:

- When flooding is expected, stay away from creeks, streams, and rivers.
- NEVER drive through flooded roads – they may be washed out.
- Passenger cars may float in only 12-24 inches of water.
- Be especially cautious at night when it is harder to recognize dangers.
- Just 6 inches of fast-moving water can knock you off your feet.
- <https://www.weather.gov/safety/flood-turn-around-dont-drown>.



## Be Prepared for Flood Emergencies

Everyone should be prepared for floods and other emergencies. Preparation begins at home, at work places, at schools, and in communities.

Floods and other disasters can strike quickly and without warning, and evacuation may be required. Basic utilities (water, gas, electricity and telephones) may be interrupted, perhaps for days. Local officials and emergency relief workers will be on the scene after disasters, but they cannot reach everyone right away. Families, communities, and businesses should:

- **Be aware.** Learn if a home or building is in a flood zone by checking the FEMA Flood Map Service Center ([see pages 12](#) and [13](#)). Pay attention to weather forecasts. Listen to local authorities.
- **Be prepared.** Put together a disaster kit with enough non-perishable food and water for a few days. Be prepared to evacuate early and know where to go. Have a plan for what to do with pets. Make a household inventory with copies of critical documents and photographs of belongings. Consider buying flood insurance because homeowners' policies do not cover flood damage.
- **Take action.** Evacuate immediately when official announcements are made.

To learn more about preparing for disasters, visit [www.water.ca.gov/floodprepare/](http://www.water.ca.gov/floodprepare/) and contact local emergency management agencies.



## Useful Resources and Common Acronyms

- DWR NFIP assistance: <https://water.ca.gov/nfip/>
- DWR Flood Management: <https://water.ca.gov/Programs/Flood-Management>
- Governor's Office of Emergency Services (coordinates hazard mitigation grants): <https://www.caloes.ca.gov/>
- Floodplain Management Association (CA, HI, NV): [www.floodplain.org](http://www.floodplain.org)
- Central Valley Flood Protection Board: <http://cvfpcb.ca.gov/>
- NFIP regulations, Title 44 CFR: [www.fema.gov/national-flood-insurance-program/laws-and-regulations](http://www.fema.gov/national-flood-insurance-program/laws-and-regulations)
- NFIP Technical Bulletins: <https://www.fema.gov/nfip-technical-bulletins>
- CRS Resources: [www.fema.gov/national-flood-insurance-program-community-rating-system](http://www.fema.gov/national-flood-insurance-program-community-rating-system)
- American Red Cross [www.redcross.org/get-help/how-to-prepare-for-emergencies/make-a-plan](http://www.redcross.org/get-help/how-to-prepare-for-emergencies/make-a-plan)

## Common Acronyms

- BFE = base flood elevation
- CCR Title 24 = California Building Standards Code
- DWR = Department of Water Resources
- EC = Elevation Certificate
- FIRM = Flood Insurance Rate Map
- NFIP = National Flood Insurance Program
- SFHA = special flood hazard area (100-year floodplain)



## Want to Learn More?

- For flood information and advice on permits, contact local building, engineering, or planning departments.
- For information about upcoming workshops and training, go to <https://water.ca.gov/nfip/>.
- Contact DWR for floodplain management technical assistance at [DWR\\_NFIP@water.ca.gov](mailto:DWR_NFIP@water.ca.gov).
- Learn about DWR's role in flood preparedness at <https://water.ca.gov/What-We-Do/Flood-Preparedness>.
- To learn more about flood maps, go to [www.fema.gov/national-flood-insurance-program-flood-hazard-mapping](http://www.fema.gov/national-flood-insurance-program-flood-hazard-mapping).
- FEMA's on-line publications can be found in the FEMA Library ([www.fema.gov/library/](http://www.fema.gov/library/)) or by using an Internet search engine to search on the publication number or title.
- To learn about federal flood insurance, call an insurance agent. Most insurance companies can write NFIP policies.
- To learn the importance of taking steps to financially protect homes and businesses from flood damage go to [www.floodsmart.gov](http://www.floodsmart.gov).
- Find out about Elevation Certificates and training for surveyors by searching for Elevation Certificate at [www.fema.gov](http://www.fema.gov).

This **Quick Guide** may be downloaded from the  
**California Department of Water Resources** web site at:

<https://water.ca.gov/nfip/>