

Displaying title 23, up to date as of 7/31/2024. Title 23 was last amended 7/15/2024. [i](#)**Title 23 — Highways****Chapter I — Federal Highway Administration, Department of Transportation****Subchapter G — Engineering and Traffic Operations****Part 650 — Bridges, Structures, and Hydraulics****ENHANCED CONTENT - TABLE OF CONTENTS****Subpart A** Location and Hydraulic Design of Encroachments on Flood Plains 650.101 – 650.117**§ 650.101** Purpose.**§ 650.103** Policy.**§ 650.105** Definitions.**§ 650.107** Applicability.**§ 650.109** Public involvement.**§ 650.111** Location hydraulic studies.**§ 650.113** Only practicable alternative finding.**§ 650.115** Design standards.**§ 650.117** Content of design studies.**Subpart A—Location and Hydraulic Design of Encroachments on Flood Plains****Source:** 44 FR 67580, Nov. 26, 1979, unless otherwise noted.**§ 650.101 Purpose.**

To prescribe Federal Highway Administration (FHWA) policies and procedures for the location and hydraulic design of highway encroachments on flood plains, including direct Federal highway projects administered by the FHWA.

§ 650.103 Policy.

It is the policy of the FHWA:

- (a) To encourage a broad and unified effort to prevent uneconomic, hazardous or incompatible use and development of the Nation's flood plains,
- (b) To avoid longitudinal encroachments, where practicable,
- (c) To avoid significant encroachments, where practicable,
- (d) To minimize impacts of highway agency actions which adversely affect base flood plains,
- (e) To restore and preserve the natural and beneficial flood-plain values that are adversely impacted by highway agency actions,
- (f) To avoid support of incompatible flood-plain development,
- (g) To be consistent with the intent of the Standards and Criteria of the National Flood Insurance Program, where appropriate, and
- (h) To incorporate "A Unified National Program for Floodplain Management" of the Water Resources Council into FHWA procedures.

§ 650.105 Definitions.

- (a) **Action** shall mean any highway construction, reconstruction, rehabilitation, repair, or improvement undertaken with Federal or Federal-aid highway funds or FHWA approval.
- (b) **Base flood** shall mean the flood or tide having a 1-percent chance of being exceeded in any given year.
- (c) **Base flood plain** shall mean the area subject to flooding by the base flood.
- (d) **Design Flood** shall mean the peak discharge, volume if appropriate, stage or wave crest elevation of the flood associated with the probability of exceedance selected for the design of a highway encroachment. By definition, the highway will not be inundated from the stage of the design flood.

- (e) **Encroachment** shall mean an action within the limits of the base flood plain.
- (f) **Floodproof** shall mean to design and construct individual buildings, facilities, and their sites to protect against structural failure, to keep water out or to reduce the effects of water entry.
- (g) **Freeboard** shall mean the vertical clearance of the lowest structural member of the bridge superstructure above the water surface elevation of the overtopping flood.
- (h) **Minimize** shall mean to reduce to the smallest practicable amount or degree.
- (i) **Natural and beneficial flood-plain values** shall include but are not limited to fish, wildlife, plants, open space, natural beauty, scientific study, outdoor recreation, agriculture, aquaculture, forestry, natural moderation of floods, water quality maintenance, and groundwater recharge.
- (j) **Overtopping flood** shall mean the flood described by the probability of exceedance and water surface elevation at which flow occurs over the highway, over the watershed divide, or through structure(s) provided for emergency relief.
- (k) **Practicable** shall mean capable of being done within reasonable natural, social, or economic constraints.
- (l) **Preserve** shall mean to avoid modification to the functions of the natural flood-plain environment or to maintain it as closely as practicable in its natural state.
- (m) **Regulatory floodway** shall mean the flood-plain area that is reserved in an open manner by Federal, State or local requirements, *i.e.*, unconfined or unobstructed either horizontally or vertically, to provide for the discharge of the base flood so that the cumulative increase in water surface elevation is no more than a designated amount (not to exceed 1 foot as established by the Federal Emergency Management Agency (FEMA) for administering the National Flood Insurance Program).
- (n) **Restore** shall mean to reestablish a setting or environment in which the functions of the natural and beneficial flood-plain values adversely impacted by the highway agency action can again operate.
- (o) **Risk** shall mean the consequences associated with the probability of flooding attributable to an encroachment. It shall include the potential for property loss and hazard to life during the service life of the highway.
- (p) **Risk analysis** shall mean an economic comparison of design alternatives using expected total costs (construction costs plus risk costs) to determine the alternative with the least total expected cost to the public. It shall include probable flood-related costs during the service life of the facility for highway operation, maintenance, and repair, for highway-aggravated flood damage to other property, and for additional or interrupted highway travel.
- (q) **Significant encroachment** shall mean a highway encroachment and any direct support of likely base flood-plain development that would involve one or more of the following construction-or flood-related impacts:
 - (1) A significant potential for interruption or termination of a transportation facility which is needed for emergency vehicles or provides a community's only evacuation route.
 - (2) A significant risk, or
 - (3) A significant adverse impact on natural and beneficial flood-plain values.
- (r) **Support base flood-plain development** shall mean to encourage, allow, serve, or otherwise facilitate additional base flood-plain development. Direct support results from an encroachment, while indirect support results from an action out of the base flood plain.

§ 650.107 Applicability.

- (a) The provisions of this regulation shall apply to all encroachments and to all actions which affect base flood plains, except for repairs made with emergency funds (23 CFR part 668) during or immediately following a disaster.
- (b) The provisions of this regulation shall not apply to or alter approvals or authorizations which were given by FHWA pursuant to regulations or directives in effect before the effective date of this regulation.

§ 650.109 Public involvement.

Procedures which have been established to meet the public involvement requirements of 23 CFR part 771 shall be used to provide opportunity for early public review and comment on alternatives which contain encroachments.

[53 FR 11065, Apr. 5, 1988]

§ 650.111 Location hydraulic studies.

- (a) National Flood Insurance Program (NFIP) maps or information developed by the highway agency, if NFIP maps are not available, shall be used to determine whether a highway location alternative will include an encroachment.
- (b) Location studies shall include evaluation and discussion of the practicability of alternatives to any longitudinal encroachments.



- (c) Location studies shall include discussion of the following items, commensurate with the significance of the risk or environmental impact, for all alternatives containing encroachments and for those actions which would support base flood-plain development:
 - (1) The risks associated with implementation of the action,
 - (2) The impacts on natural and beneficial flood-plain values,
 - (3) The support of probable incompatible flood-plain development,
 - (4) The measures to minimize flood-plain impacts associated with the action, and
 - (5) The measures to restore and preserve the natural and beneficial flood-plain values impacted by the action.
- (d) Location studies shall include evaluation and discussion of the practicability of alternatives to any significant encroachments or any support of incompatible flood-plain development.
- (e) The studies required by § 650.111 (c) and (d) shall be summarized in environmental review documents prepared pursuant to 23 CFR part 771.
- (f) Local, State, and Federal water resources and flood-plain management agencies should be consulted to determine if the proposed highway action is consistent with existing watershed and flood-plain management programs and to obtain current information on development and proposed actions in the affected watersheds.

● **§ 650.113 Only practicable alternative finding.**

- (a) A proposed action which includes a significant encroachment shall not be approved unless the FHWA finds that the proposed significant encroachment is the only practicable alternative. This finding shall be included in the final environmental document (final environmental impact statement or finding of no significant impact) and shall be supported by the following information:
 - (1) The reasons why the proposed action must be located in the flood plain,
 - (2) The alternatives considered and why they were not practicable, and
 - (3) A statement indicating whether the action conforms to applicable State or local flood-plain protection standards.
- (b) [Reserved]

[44 FR 67580, Nov. 26, 1979, as amended at 48 FR 29274, June 24, 1983]

● **§ 650.115 Design standards.**

- (a) The design selected for an encroachment shall be supported by analyses of design alternatives with consideration given to capital costs and risks, and to other economic, engineering, social and environmental concerns.
 - (1) Consideration of capital costs and risks shall include, as appropriate, a risk analysis or assessment which includes:
 - (i) The overtopping flood or the base flood, whichever is greater, or
 - (ii) The greatest flood which must flow through the highway drainage structure(s), where overtopping is not practicable. The greatest flood used in the analysis is subject to state-of-the-art capability to estimate the exceedance probability.
 - (2) The design flood for encroachments by through lanes of Interstate highways shall not be less than the flood with a 2-percent chance of being exceeded in any given year. No minimum design flood is specified for Interstate highway ramps and frontage roads or for other highways.
 - (3) Freeboard shall be provided, where practicable, to protect bridge structures from debris- and scour-related failure.
 - (4) The effect of existing flood control channels, levees, and reservoirs shall be considered in estimating the peak discharge and stage for all floods considered in the design.
 - (5) The design of encroachments shall be consistent with standards established by the FEMA, State, and local governmental agencies for the administration of the National Flood Insurance Program for:
 - (i) All direct Federal highway actions, unless the standards are demonstrably inappropriate, and
 - (ii) Federal-aid highway actions where a regulatory floodway has been designated or where studies are underway to establish a regulatory floodway.
- (b) Rest area buildings and related water supply and waste treatment facilities shall be located outside the base flood plain, where practicable. Rest area buildings which are located on the base flood plain shall be floodproofed against damage from the base flood.
- (c) Where highway fills are to be used as dams to permanently impound water more than 50 acre-feet (6.17×10^4 cubic metres) in volume or 25 feet (7.6 metres) deep, the hydrologic, hydraulic, and structural design of the fill and appurtenant spillways shall have the approval of the State or Federal agency responsible for the safety of dams or like structures within the State, prior to authorization by the Division

Administrator to advertise for bids for construction.

⦿ **§ 650.117 Content of design studies.**

- (a) The detail of studies shall be commensurate with the risk associated with the encroachment and with other economic, engineering, social or environmental concerns.
- (b) Studies by highway agencies shall contain:
 - (1) The hydrologic and hydraulic data and design computations,
 - (2) The analysis required by § 650.115(a), and
 - (3) For proposed direct Federal highway actions, the reasons, when applicable, why FEMA criteria (44 CFR 60.3, formerly 24 CFR 1910.3) are demonstrably inappropriate.
- (c) For encroachment locations, project plans shall show:
 - (1) The magnitude, approximate probability of exceedance and, at appropriate locations, the water surface elevations associated with the overtopping flood or the flood of § 650.115(a)(1)(ii), and
 - (2) The magnitude and water surface elevation of the base flood, if larger than the overtopping flood.