

1004 Flood Clearance

1004.1 General

Where a new highway crosses or is located in a flood plain, the highway grade shall normally be set such that the low edge of the pavement will clear the design water surface profile for existing conditions by 3 feet, and bridges (low chord) will generally clear the water surface profile of the design year frequency flood. These clearances may be reduced where an economic comparison of alternatives shows that a reduction in clearance will result in significant savings, giving full consideration to future flood-related costs relative to: highway operation, maintenance, and repair; highway-aggravated flood damage to other property; and for additional or interrupted highway travel.

Flood clearances may also be reduced to protect important ecological resources as identified in the environmental documentation. An economic comparison of alternatives shall be performed to determine the future flood-related costs relative to: highway operation, maintenance, and repair; highway-aggravated flood damage to other property; and for additional or interrupted highway travel.

1004.2 Design Year Frequency

Freeways or other multi-lane facilities with limited access.....	50 Year
Other Highways (2000 ADT and over) and Freeway Ramps.....	25 Year
Other Highways (under 2000 ADT).....	10 Year
*Bicycle pathway.....	5 Year

* Unless otherwise approved by OHE.

1005 Highway Encroachments on Flood Plains

1005.1 General

The requirements of the Federal Code of Regulations, Volume 23, Part 650A, shall be followed for all projects. **All highways that encroach on flood plains, bodies of water or streams, shall be designed to permit conveyance of the 100-year flood without causing significant damage to the highway, the stream, body of water or other property.**

Hydraulically design structures and/or channels to convey the design-year discharge. Ensure the structure and/or channel will convey the 100-year discharge without causing property damage. Inundation of the highway is acceptable for the 100-year discharge, but it is not permitted for the design-year discharge. Water surface elevations caused by existing structures do not have to be lowered to meet the 100-year discharge.

Longitudinal highway encroachments require alternative location studies to be summarized in the Conceptual Alternatives Study (L&D Section 1403.3).

1005.1.1 Flood Insurance Studies (FIS)

Special consideration must be given when designing a structure located within a reach of channel that is part of a FIS. Perform a step backwater analysis of the flood plain to the extent required due to the proposed work. The proposed maximum allowable 100-year water surface elevation is limited to the existing 100-year water surface elevation presented in the flood insurance study. Inform the local floodplain coordinator of any proposed construction within the limits of a flood prone area as designated by an FIS (see 1006.4).

1005.1.2 Flood Insurance Zones

Flood hazard areas identified on the Flood Insurance Rate Map (FIRM) are identified as a Special Flood Hazard Area (SFHA). SFHA are defined as the area that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. The 1-percent annual chance flood is also referred to as the base flood elevation (BFE) or 100-year flood. SFHAs are labeled as different Zones. Flood Insurance Zone designations may be accessed at the following web site: <https://msc.fema.gov/webapp/wcs/stores/servlet/info?storeId=10001&catalogId=10001&langId=-1&content=floodZones&title=FEMA%2520Flood%2520Zone%2520Designations>

The more common FIS Risk zones are as follows:

ZONE	DESCRIPTION
A	Areas with a 1% annual chance of flooding. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown within these zones.
AE	The base floodplain where base flood elevations are provided. AE Zones are now used on new format FIRMs instead of A1-A30 Zones.
A1-30	These are known as numbered A Zones (e.g., A7 or A14). This is the base floodplain where the FIRM shows a BFE (old format).

1005.2 Type of Studies

1005.2.1 Flood Hazard Evaluation

A flood hazard evaluation is required for all water course involvements except for crossings where roadway culverts are provided to satisfy minimum size requirements. . A Flood Hazard Evaluation is a condition statement regarding the nature of the upstream area, the extent of upstream flooding, and whether buildings are in the 100 year frequency flood plain. Perform the following for a flood hazard evaluation:

- A. Determine the water surface elevation of the design year and 100-year flood.
- B. Delineate the water surface elevation for the design year and 100-year flood on a topographic map or a digital map.
- C. Evaluate the significance of any increase in the flooding limits.

1005.2.2 Detailed Flood Plain Study

If the Flood Hazard Evaluation indicates a significant increase in the flooding of upstream property, a Detailed Flood Plain Study is required. Furnish a Detailed Flood Plain Study in highly urbanized areas where the potential for flooding cannot be accurately assessed without an analysis of the entire flood plain. For prefabricated structures, the Detailed Flood Plain Study, including a step-backwater analysis, will be authorized after review of the Flood Hazard Evaluation, by OHE.

1006 Allowable Headwater

1006.1 Design Storm

The frequency of the design storm shall be as stated in Section 1004.2.

1006.2 Culvert Headwater Controls

1006.2.1 Design Storm Controls

Headwater depth for all culverts (Type A Conduits) shall not exceed any of the following controls for the design storm:

- A. 2 feet below the near, low edge of the pavement for drainage areas 1000 acres or greater and 1 foot below for culverts draining less than 1000 acres.
- B. 2 feet above the inlet crown of the culvert or above a tailwater elevation that submerges the inlet crown in flat to rolling terrain.
- C. 4 feet above the inlet crown of a culvert in a deep ravine.
- D. 1 foot below the near edge of pavement for bicycle pathways.

1006.2.2 Check Storm Controls

Headwater depth for all culverts (Type A Conduits) shall not exceed any of the following controls for the applicable check frequency storm.

- A. 2 feet below the lowest ground elevation adjacent to an occupied building for a 50-year storm (it is not intended, however, to lower existing highwater elevations around buildings).
- B. The designer should generally limit the maximum 100-year headwater depth to twice the diameter or rise of the culvert.
- C. A replacement structure should be sized to prevent overtopping by the 100-year flood where such overtopping would not occur with the existing structure.
- D. A replacement structure should be sized such that flooding of upstream productive land is not increased for the 100-year flood when compared to the existing structure. Judgment shall be used in implementing this policy, considering the type of upstream property and sensitivity to the accuracy of the computed flood stages.
- E. No increase in 100-year headwater elevation shall occur in a FEMA designated floodway.

1006.2.3 Limitations

1006.2.1 B and C; and 1006.2.2 B, are arbitrary headwater controls. When 1006.2.1 B is applicable, use smooth pipe to establish the allowable headwater in feet. When 1006.2.1 C controls, use corrugated pipe to establish the headwater and thereby permit the same headwater elevation regardless of type of pipe. More heading will be considered if pipe sizes can be reduced and not cause flooding damage upstream or excessive outlet velocity.

1006.2.1 B and C are arbitrary controls and generally apply to small culverts. Where large structures (greater than or equal to 10 feet in span) are involved, the structure should be sized to pass the design storm while maintaining a free water surface through the structure, unless tailwater controls.

The near low edge of pavement is the location where roadway overtopping will occur. This may or may not be located directly over the culvert. Where the overtopping point on the roadway is outside the watershed break, the ditch break overflow elevation should be utilized as a headwater control in lieu of 1006.2.1 A.

1006.2.4 Controls Specific to Flood Plain Insurance Studies

When making an encroachment on a NFIP designated floodplain in the floodway fringe, the rise in the water surface above the natural 100 year flood elevation is limited by the community. Contact the community to determine the allowable rise.

No increase in the 100 year water surface is allowed when encroaching on a NFIP designated floodway.

1006.3 Bridge Headwater Control

Evaluate the headwater generated by a bridge in accordance to a flood hazard evaluation. Ensure the headwater meets the following:

- A. Match the existing headwater for a bridge replacement for the design storm and the check flood to the maximum extent practicable. Any increase in headwaters verify the upstream impacts
- B. Design flood does not contact the low chord for new structures on new alignment.
- C. Regulations from Conservancy Districts if they are more restrictive than the Departments
- D. Controls specific to a FIS.

1006.4 Controls Specific to Flood Insurance Studies (FIS)

Contact the local floodplain coordinator early in the design process to determine the allowable headwater increase and or the permitting requirements. A current list of floodplain coordinators may be found at: <http://www.dnr.state.oh.us/Portals/7/floodpln/communitylist.pdf>.

When making an encroachment on a FIS designated floodplain in the floodway fringe, the rise in the water surface above the natural 100 year flood elevation is limited by the community. See Figure 1006-1 for a graphical definition of the floodway, floodway fringe, and flood plain.

No increase in the 100 year water surface is allowed when encroaching on a FIS designated floodway.

1007 Pipe Removal Policy

1007.1 General

Use the following guidelines to determine whether an existing pipe, regardless of type, being taken out of service should be abandoned or removed.

- A. Pipes 8 inches in diameter or rise, or less, regardless of depth or height of fill, may be abandoned in place.
- B. Pipes 10 inches through 24 inches in diameter or rise with less than 3 feet of final cover should be removed or filled; with more than 3 feet of final cover they may be abandoned in place. (The designer should use discretion in removing small pipes under existing rigid pavement or base, which is to remain in place.)
- C. Pipes over 24 inches in diameter or rise should generally be removed. (The designer should use discretion in removing any pipe with more than 10 feet of cover.)