

2.2 DEFINITIONS

Revise as follows:

Base Flood–The flood or tide flow having a 1% chance of being equaled or exceeded in any given year. Also known as Q_{100} .

Check Flood for Bridge Scour–Check flood for scour. The flood resulting from storm, storm surge, and/or tide having a flow rate in excess of the design flood for scour, but in no case a flood with a recurrence interval exceeding the typically used 500 years. The check flood for bridge scour is used in the investigation and assessment of a bridge foundation to determine whether the foundation can withstand that flow and its associated scour and remain stable with no reserve. See also superflood.

Contraction Scour–See “General Scour”, below.

Design Discharge–Maximum flow of water a bridge is expected to accommodate without exceeding the adopted design constraints. (See CA Amendment 2.6.3 for additional comments.)

Design Flood–The flood or tide flow having a 2% chance of being equaled or exceeded in any given year. Also known as Q_{50} .

Flood of Record–The largest record flood at the bridge site.

Freeboard–The vertical distance from bridge soffit, bottom-of-girder, or other physical feature to the water surface at a given discharge.

General or Contraction Scour–Scour in a channel or on a floodplain that is not localized at a pier or other obstruction to flow. In a channel, general/contraction scour usually affects all or most of the channel width and is typically caused by a contraction of the flow within a specific reach due to channel geometrics.

Local (Pier) Scour—Scour in a channel or on a floodplain that is localized at a pier, abutment, or other obstruction to flow.

Scour—The summation of contraction scour, aggradation, degradation, and local scour. Also referred to as total scour.

Scupper—A feature ~~device~~ to drain roadway water immediately off ~~through~~ the deck.

Superflood—Any flood or tidal flow with a flow rate greater than that of the 100-year flood but in no case a flow rate ~~not~~ greater than a 500-year flood.

2.6.1 General

Revise the 3rd Paragraph as follows:

Evaluation of bridge design alternatives shall consider stream impacts, including but not limited to, stability, debris, backwater, flow distribution, stream velocities, scour potential, flood hazards, tidal dynamics where appropriate and consistency with established criteria for the National Flood Insurance Program.

C2.6.2

Revise the 1st Paragraph as follows:

The assessment of hydraulics necessarily involves many assumptions. Key among these assumptions are the roughness coefficients and projections of long-term flow magnitudes, e.g., ~~the 500-year flood~~ or other superfloods. The runoff from a given storm can be expected to change with the seasons, immediate past weather conditions, and long-term natural and man-made changes in surface conditions. The ability to statistically project long recurrence interval floods is a function of the adequacy of the database of past floods, and such projections often change as a result of new experience.

The above factors make the ~~check-flood~~ investigation of scour an important, but highly variable, safety criterion that may be expected to be difficult to reproduce, unless all of the Designer's original assumptions are used in a post-design scour investigation. Obviously, those original assumptions must be reasonable given the data, conditions, and projections available at the time of the original design.

2.6.4.3 Bridge Waterway

Revise as follows:

The design process for sizing the bridge waterway shall include:

- The evaluation of flood flow patterns in the main channel and floodplain for existing conditions, and
- The evaluation of trial combinations of highway profiles, alignments, superelevations, and bridge lengths and widths should provide adequate freeboard to pass anticipated drift for the Q₅₀ design flood, to pass the Q₁₀₀ base flood without freeboard, or the flood of record without freeboard, whichever is greater ~~for~~ consistency with design objectives.

2.6.4.4.2 Bridge Scour

Revise the 1st Paragraph as follows:

As required by Article 3.7.5, scour at bridge foundations is investigated for ~~two conditions~~:

- For the design flood for scour, the streambed material in the scour prism above the total scour line shall be assumed to have been removed from design conditions. The design flood storm surge, tide, or mixed population flood shall be the more severe of the 100-year events or from an overtopping flood of lesser recurrence interval.
- For the check flood for scour, the stability of bridge foundation shall be investigated for scour conditions resulting from a designated flood storm surge, tide, or mixed population flood not to exceed the superflood ~~500-year event~~ or from an overtopping flood of lesser recurrence interval. Excess reserve beyond that required for stability under this condition is not necessary. The extreme event limit state shall apply.

Revise the 3rd paragraphs as follows:

Spread footings on soil or erodible rock shall be located so that the top of footing is below the design flood for bridge scour and the bottom of footing is below scour depths determined for the check flood for scour. Spread footings on scour-resistant rock shall be designed and constructed to maintain the integrity of the supporting rock.

C2.6.4.4.2

Add the following after the 3rd Paragraph:

Total scour is calculated based upon the cumulative effects of contraction, degradation, and local scour. Figure C2.6.4.4.2-1 shows a typical spread footing foundation.

Revise the 4th Paragraph as follows:

Total scour is calculated based upon the cumulative effects of the long-term degradation scour, general (contraction) scour and local scour due to the base flood. Figure C1 shows degradation, contraction, and local pier scour depth for a typical spread footing foundation. The life expectancy of the bridge should be considered in determining the total degradation or aggradation of the waterway. Long-term scour is based on an assumed 75-year design life for new construction projects. The recommended procedure for determining the total scour depth at bridge foundations is as follows:

- Service life for a new construction project is assumed to be 75-years.

Other bullets remain the same as AASHTO

2.6.4.4.2

Revise the 4th Paragraph as follows:

Deep foundations with footings shall be designed to place the top of the footing below the estimated degradation plus contraction scour depth where practical to minimize obstruction to flood flows and resulting local scour. Even lower elevations should be considered for pile-supported footings where the piles could be damaged by erosion and corrosion from exposure to stream currents. Where conditions dictate a need to construct the top of a footing to an elevation above the streambed, attention shall be given to the scour potential of the design.

C2.6.4.4.2

Add the following after the 4th Paragraph:

Foundations should be designed to withstand the conditions of scour. In general, this will result in deep foundations. Figure C6.4.2.2-1 shows a typical deep foundation.

Add Fig. C2.6.4.4.2-1 as follows:

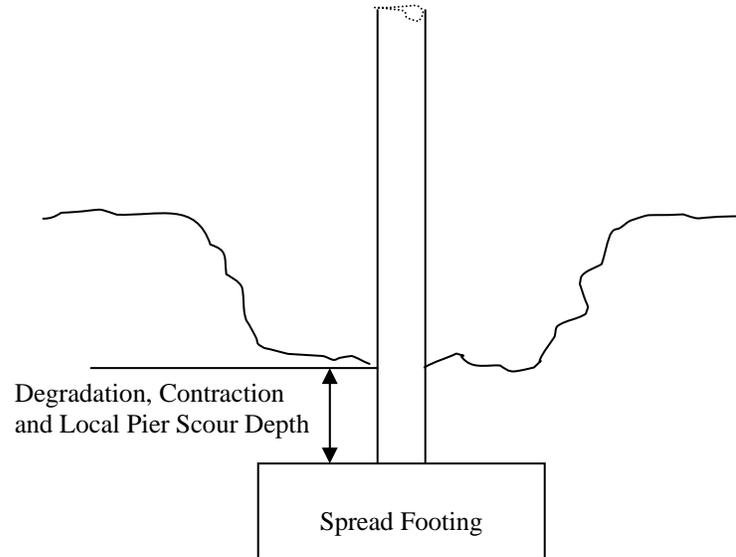


Figure C2.6.4.4.2-1 Spread Footing Location

Revise the 6th Paragraph as follows:

Foundations should be designed to withstand the conditions of scour for the Q_{100} base design flood and the creek flood. In general, this will result in deep foundations. However, environmental concerns may preclude locating the footing below anticipated scour level. Figure C2 shows degradation, local contraction and local pier scour for a typical deep foundation. The design of the foundations of existing bridges that are being rehabilitated should consider appropriate countermeasures underpinning if scour indicates the need. Riprap and other scour countermeasures may be appropriate if underpinning is not cost effective.

2.6.4.4.2

Revise the 6th Paragraph as follows:

The stability of abutments in areas of turbulent flow shall be thoroughly investigated. Exposed embankment slopes should be protected with appropriate ~~seour~~ countermeasures. Abutment footings shall be designed so as to be stable for permanent loads and hydraulic forces assuming the loss of approach fill. Deep foundations may be necessary.

C2.6.4.4.2

Add the following after the 6th Paragraph:

Add Figure C2.6.4.4.2-2 as follows:

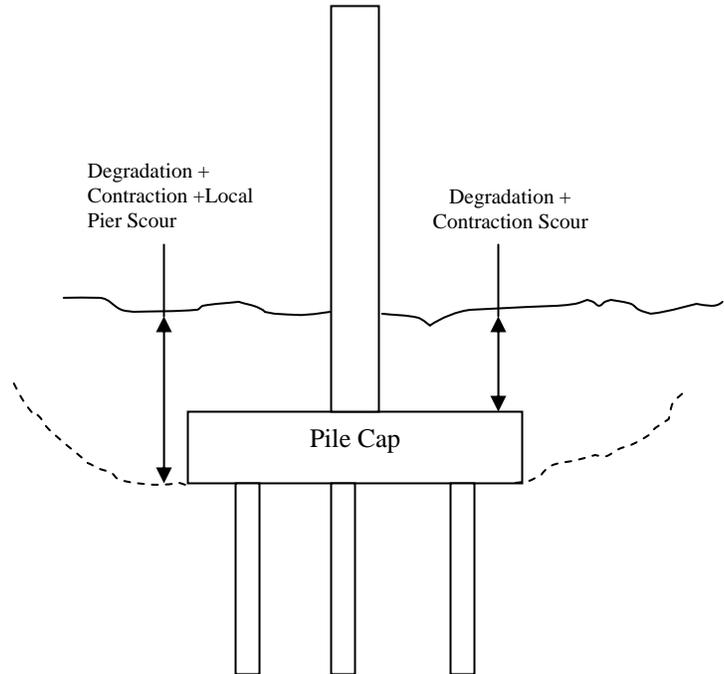


Figure C2.6.4.4.2-2 Deep Foundation Location