



GLOSSARY OF TERMINOLOGY FOR HYDRAULICS & SCOUR

Definitions (refer to AASHTO LRFD-BDS-CA Section 2.2)

Common terminology has been defined below for easy reference.

Abutment Scour	Abutment scour is essentially a form of scour at a short contraction. Accordingly, scour is closely influenced by flow distribution through the short contraction and by turbulence generated and dispersed in the form of eddies and vortices, by flow entering the short contraction.
Aggradation	General and progressive buildup (long term) of the longitudinal profile of a channel bed due to sediment deposition.
Backwater	The increase in water surface elevation relative to its elevation occurring under natural channel and floodplain conditions. It is induced by a bridge or other structure that obstructs or constricts the free flow of water that occurs in a channel.
Bank Protection:	Engineering works for the purpose of protecting streambanks from erosion.
Base Flood	Discharge associated with the 100-year flood recurrence interval.
Base floodplain	Floodplain associated with the flood with a 100-year occurrence interval.
Bedrock	The solid rock exposed at the surface of the earth or overlain by soils and unconsolidated material.
Bridge Waterway	The cross-sectional area of a bridge opening available for flow, as measured below a specified stage and normal to the principal direction of flow.
Bulking	Increasing the water discharge to account for high concentrations of sediment in the flow.
Channel Profile	A plot of the stream channel elevations relative to distance separating them along the length of the channel that generally can be assumed as a channel gradient. Profile line may follow distinct features such as thalweg or bank toe.



SUPERSEDES MEMO TO DESIGNERS 1-23 DATED OCTOBER 2003

Check Flood	A risk-based approach for a superflood event (not to exceed a 500-year event) to provide a larger safety margin for scour resistance. Assessment of this scour condition in excess of the design life of the bridge attempts to balance the risk of failure from hydraulic and scour events. The flood may be resulting from storm, storm surge, and/or tide.
Clear-Water Scour	Scour at a pier or abutment (or contraction scour) when there is no movement of the bed material upstream of the bridge crossing at the flow causing scour. Clear-water scour occurs where there is flowing water with no sediment transport or suspended material which is not re-deposited when flows recede.
Contraction Scour	Contraction scour, in a natural channel or at a bridge crossing, involves the removal of material from the bed and banks across all or most of the channel width. This component of scour results from a contraction of the flow area at the bridge which cause an increase in velocity and shear stress on the bed at the bridge. The contraction can be caused by the roadway embankments leading to a bridge in a floodway or from a natural narrowing of the stream channel.
Conveyance	Flow conveyance is the flow capacity through a given channel reach for a given stage, independent of slope. The channel size and shape are important factors in determining flow conveyance.
Countermeasure	A measure intended to prevent, delay or reduce the severity of hydraulic problems.
Cross section	A section normal to the trend of a channel or flow.
Cutoff Wall	A wall, usually sheet piling or concrete, that extends down to scour-resistant material or below the expected scour depth. A cutoff wall is intended to prevent undermining.
Degradation	A general and progressive (long term) lowering of the channel bed due to erosion, over a relatively long channel length.
Depth of Scour	The vertical distance a streambed is lowered by scour below a reference elevation.
Design Flood	The peak discharge of the flood associated with the probability of exceedance selected for the design of a highway encroachment.
Design Flow (Design Flood)	The discharge that is selected as a basis for the design or evaluation of a hydraulic structure including a hydraulic design flood, scour design flood and scour design check flood.



SUPERSEDES MEMO TO DESIGNERS 1-23 DATED OCTOBER 2003

Discharge	Volume of water passing through a channel during a given time.
Drainage Basin	Geographical area confined by drainage divides, often having only one outlet for drainage. A synonymous term is watershed area.
Drift	Alternative term for vegetative “debris”. Floating or non-mineral burden of a stream. The name for all material of land origin found floating and transported anywhere across waterways or at sea.
Eddy Current:	A vortex-type motion of a fluid flowing contrary to the main current, such as the circular water movement that occurs when the main flow becomes separated from the bank.
Ephemeral Stream	A stream that does not flow for parts of the year.
Erosion	Displacement of soil particles due to water or wind action.
Filter	Layer of fabric (geotextile) or granular material (sand, gravel or graded rock) placed between bank revetment (or bed protection) and soil for the following purposes: (1) to prevent the soil from moving through the revetment by piping, extrusion, or erosion; (2) To prevent the revetment from sinking into the soil; and (3) to permit natural seepage from the streambank, thus preventing a buildup of excessive hydrostatic pressure.
Filter Fabric	Geosynthetic fabric that serves the same purpose as a granular filter blanket.
Flanking	Erosion around the landward end of a stream stabilization countermeasure.
Flood Frequency	Also referred to as exceedance interval, recurrence interval or return period; the average time interval between actual occurrences of a hydrological event of a given or greater magnitude.
Floodplain	A nearly flat, alluvial lowland bordering a stream that is subject to frequent inundation by floods.
Floodway	The stream channel and that portion of the adjacent floodplain that must remain open to permit passage of the base flood. The floodway is a regulatory measure to assist communities with protecting the river corridor where flows are most sensitive to encroachment.
Fluvial Geomorphology	The science dealing with the morphology (form) and dynamics of streams and rivers.



SUPERSEDES MEMO TO DESIGNERS 1-23 DATED OCTOBER 2003

Freeboard	The vertical distance above a design stage that is allowed for waves, surges, drift or other contingencies.
General scour	General scour refers to the aggradation or degradation of geomaterials in the riverbed that is not due to the local obstacles present at a bridge.
Grade-Control Structure	Structure placed bank to bank across a stream channel (usually with its central axis perpendicular to flow) for the purpose of controlling bed slope and preventing scour or headcutting.
Guide Bank	A dike extending upstream and/or downstream from the approach embankment at either or both sides of a bridge opening to direct the flow through the opening.
Guide Wall	A guide wall is defined as a group of conventional columns connected by non-structural walls. The connection of guide walls to columns are designed to detach during a seismic event, allowing the columns to meet the seismic deformation demands while satisfying the hydraulic needs of reducing debris accumulation that leads to debris loads to the bridge foundation.
Headcutting	Channel degradation associated with abrupt changes in bed elevation (headcut) that generally migrates in an upstream direction.
HEC-RAS	US Army Corps of Engineers River Analysis System (HEC-RAS). A computer software program developed by the Army Corps of Engineers Hydraulic Engineering Center (HEC). This software performs one-dimensional calculations to create a hydraulic model and determine hydraulic parameters such as velocity and water surface elevation.
Hydraulic Design Flood	A traditional predetermined design flood frequency selected for obtaining waterway adequacy and freeboard with assumed inherent levels of risk. This design flood is a standard design criteria used in determining a minimum bridge soffit. (see Design Flood)
Hydraulics	Applied science concerned with the behavior and flow of liquids, especially in pipes, channels, structures and the ground.
Hydraulic Model	Small scale physical or mathematical representation of a flow situation.
Hydrograph	The graph of stage or discharge versus time.



SUPERSEDES MEMO TO DESIGNERS 1-23 DATED OCTOBER 2003

Hydrology	Science concerned with the occurrence, distribution, and circulation of water on the earth. Hydrologic analysis methods are used to estimate design discharges.
Incised Stream	Stream which has deepened its channel through the bed of the valley floor, so that the floodplain is a terrace.
Invert	Lowest point in the channel cross section or at flow control devices such as weirs, culverts, or dams.
Ineffective Flow	Ineffective flow areas are often used to describe portions of a cross section in which water will pond, but the velocity of that water, in the downstream direction, is close to zero. This water is included in the storage calculations and other wetted cross section parameters, but it is not included as part of the active flow area for conveyance. When using ineffective flow areas, no additional wetted perimeter is added to the active flow area.
Lateral Erosion	Erosion in which the removal of material is extended horizontally as contrasted with degradation and scour in a vertical direction.
Live-Bed Scour	Scour at a pier or abutment (or contraction scour) when the bed material in the channel upstream of the bridge has suspended streambed particles in the flow causing scour. Live-bed scour occurs where there is flowing water with sediment transport or suspended material which can be re-deposited when flows recede.
Local Scour	Removal of material from around piers, abutments, spurs, and embankments caused by an acceleration of flow and resulting vortices induced by obstructions to the flow.
Long Term Scour	Scour which only accounts for long-term scour (degradation). A differentiation must be made between long-term scour (degradation) and short-term scour.
Migration	Change in position of a channel by lateral erosion of one bank and simultaneous accretion of the opposite bank.
Overtopping Flood	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.
Piping	Removal of soil material through subsurface flow of seepage water that develops channels or “pipes” within the soil banks.
Pressure Flow Scour	Scour resulting from flow impinging on bridge superstructure elements (e.g., low chord). Backwater occurs and a vertical contraction causes increased velocities resulting in scour.



SUPERSEDES MEMO TO DESIGNERS 1-23 DATED OCTOBER 2003

Probability of Exceedance	Statistical probability that a certain frequency T-year (i.e. 100-year) flood has a P-percent probability of occurring any given year.
Recurrence Interval	Reciprocal of the annual probability of exceedance of a hydrologic event. (also return period, exceedance interval)
Return Period	Also known as a recurrence interval (sometimes repeat interval) is an estimate of the likelihood of an event, such as an earthquake, flood or a river discharge flow to occur.
Revetment	Rigid or flexible armor placed to inhibit scour and lateral erosion. (eg: Rock Slope Protection, riprap, gabions).
Riparian	Pertaining to anything connected with or adjacent to the banks of a stream.
Riprap	Layer of rock or broken concrete dumped or placed to protect a structure or embankment from erosion.
Rock Slope Protection (RSP)	An armoring layer or layers of rock rip-rap that is placed along river and streambanks, or along ocean and lake shores to prevent erosion from hydraulic forces of flowing water.
Scour	Erosion of streambed or bank material due to flowing water; often considered as being localized. (see Local Scour, Contraction Scour, Total scour, etc)
Scour Design Flood	A traditional predetermined design flood frequency selected for assessing the structure stability for scour condition. This design flood frequency typically assumes a level of risk to accommodate the Base Flood. (see Design Flood)
Scour Design Check Flood	A traditional predetermined design flood frequency selected for assessing the structure stability for scour condition under Extreme Event II. This design flood frequency typically does not exceed the 500-year flood. (see Design Flood)
Scour Prism	Total volume of stream bed material removed by scour in the bridge reach for design flood conditions.
Scour-Resistant Material	Bed material that has the ability to resist any erosion from flowing water it may encounter.
Short Term Scour	Scour which includes local scour and general contraction scour. A differentiation must be made between long-term scour (degradation) and short-term scour.
Slope Protection	Any measure such as riprap, paving, vegetation, revetment, brush or other material intended to protect a slope from erosion, slipping or caving, or to withstand external hydraulic pressure.



SUPERSEDES MEMO TO DESIGNERS 1-23 DATED OCTOBER 2003

Sloughing	Sliding or collapse of overlying material; same ultimate effect as caving, but usually occurs when a bank or an underlying stratum is saturated.
Stage	Water surface elevation of a stream with respect to a reference elevation.
Thalweg	A flow line extending down a channel that follows the lowest elevation of the stream bed.
Total Scour	Sum of long-term degradation, general (contraction) scour and local scour.
Turbulence	A state of flow wherein the water is agitated by cross-currents and eddies, as opposed to a condition of flow that is quiet and laminar. Interference with flow from bridge foundations tend to cause turbulence.
Vertical Contraction Scour	See Pressure Flow Scour.
Waterway Opening	Conveyance area or width of bridge opening at or below a specified stage, measured normal to the principal direction of flow.
Watershed	See Drainage Basin.
Vortex:	Turbulent eddy in the flow generally caused by an obstruction such as a bridge pier or abutment.