

BRIDGE DESIGN STANDARD PRACTICES

The following standard practices were established by the Bridge Design Standard Practices Committee.

A Design Practice entitled "Pile Supported Foundations over Waterways", issued with CE General Memo 94-7, has caused some confusion on occasion. Therefore, the following new Design Practice "Bridges over Waterways" is being issued to clarify and expand on this previous practice.

1. **Bridges over Waterways**

Substructures for bridges over waterways shall be designed to safely support the structure subjected to the design scour. This policy is based upon the design guidelines contained within the FHWA document entitled "Evaluating Scour at Bridges" (HEC-18), wherein it states that "Bridges should be designed to withstand the effects of scour from a superflood with little risk of failing."

With regard to abutment or pier foundations, two basic approaches to achieving this goal are available to the designer, listed as follows in order of preference:

a) **Design the foundation to resist the effects of scour from a superflood.**

Foundations subjected to scour shall be designed with footings supported on piles, footings founded on rock or deep footings (located below the maximum estimated scour). Structural tremies (concrete poured under water which directly supports the foundation loads) will be allowed in very limited situations, only where no other solution is feasible, and only with the approval of the Department. Preference for foundations adjacent to or within waterways will be for pile supported footings or direct foundations on rock. For pile foundations, the top of footing shall be set below the sum of the long term degradation and contraction scour.

b) **Protect the substructure units with riprap or similar armoring layers.**

In general, the use of riprap to provide scour protection for new bridges is discouraged and should be used only where it has been demonstrated that alternate, preferred means of designing bridges to be safe from scour related failures are not feasible. On bridge rehabilitation projects where the substructure is being repaired and incorporated in the reconstruction of the bridge, riprap scour countermeasures may be an effective solution for protecting the bridge from scour.

The designer should explore and incorporate into the design all reasonable methods of minimizing local scour, such as the use of embankment or "stub" abutments placed at the top of a protected slope. These types of abutments are much less susceptible to scour than full height abutments. The use of stub abutments does not relieve the requirement for founding on piles or directly on rock. Piers which may experience local scour should be flow aligned and should have streamlined end sections.

2. **Erection Plans for Bridges over Electrified Rail Lines**

In order to expedite railroad approvals and avoid delays during construction, design plans for bridges being erected over electrified rail lines must include full erection plans including crane requirements and placement, pick points, erection sequence, etc.

3. **Approach Slabs**

Approach slabs shall be provided as specified in Section 5.8 of the Bridge Design Manual. Permission to omit approach slabs should only be given in very limited circumstances where constructability of the approach slabs is in question.

Skews of approach slab ends should be limited to approximately 35 degrees. Above this limit, approach slabs should be squared off or special permission received from the Department to place on a skew. Acute corners of approach slabs and approach pavement should be squared off for a distance of 1.5 meters from the gutter line.

4. **Protective Fence**

Where Protective Fence is provided, it shall consist of black PVC-coated fabric with galvanized posts and rails. Exceptions should be allowed only for showcase bridges or bridges with architectural or historic significance.