RIPRAP BANK STABILIZATION
DESIGN PROCEDURE AND CRITERIA

Iowa standard Streambank and Shoreline Protection (580) shall be followed to plan, design, and install riprap bank stabilization.

The following design procedures and criteria will supplement Standard 580 and be applicable to riprap bank stabilization including bank hide structures.

The use of this procedure is limited to sites with gravel or rock bottoms.

DRAINAGE AREAS 30 SQUARE MILES OR LESS

Minimum Survey Requirements

- Mark the beginning and ending points of the riprap section with lath, stakes, etc.
- Obtain a bank and flowline shot every 50 feet, or more often if needed to show changes in the bank height.
- Cross sections are not required.
- A minimum of one or two shots as needed to document the low bank height.

Design Requirements

- Minimum rock thickness shall be 2 feet measured perpendicular to the bank.
- Rock with a minimum D50 of 12 inches shall be used unless other rock sizes are justified based on design calculations.
- Streambank Stabilization Standard drawings may be used without checking the flow velocity in the stream.
- If the riprap is to be placed on the side of the stream with a low bank, extend the riprap to the top of the low bank.
- If the riprap is to be placed on the side opposite of the low bank, extend the rock to 1 foot above the elevation of the low bank.
- A geotextile filter should be placed under the riprap if the water table or seepage occurs above the normal water surface.
- The armored cross section shall be at least as large as the adjacent natural stream cross section.

DRAINAGE AREAS GREATER THAN 30 SQUARE MILES

Minimum Survey Requirements

- Mark the beginning and ending points of the riprap section with lath, stakes, etc.

- Obtain a bank and flowline shot every 50 feet, or more often if needed to show changes in the bank height.
- Obtain one or more cross sections as needed to determine flow velocity, channel capacity, and excavation/fill quantities.
- Obtain random shots on the low bank as needed for determining the bankfull capacity.

Design Requirements

- Determine the peak flow. This will generally be accomplished by using the USGS publication "Techniques for Estimating Flood-Frequency Discharges for Streams in Iowa". The standard error of estimate may be considered when making the peak flow calculations.
- Determine the flow velocity in the stream. Channel alignment (curvature) should be considered when designing for site conditions. For channel bends, either double the computed velocity and size rock riprap accordingly or use other approved methods as outlined in Table 16-2.
- Determine the channel capacity at various elevations.
- Rock should extend to the elevation of the Q1.5 flow elevation. The Q1.5 flow will be determined by extrapolating from the tables in the USGS publication named above.
- The allowable maximum velocity for various rock sizes shall be as follows:

D50	Allowable Velocity
10 inches	8.4 fps
12 inches	9.1 fps
16 inches	10.4 fps

- Minimum rock thickness shall be 2 feet measured perpendicular to the bank.
- Geotextile shall be used under the rock as follows:
  - For drainage areas between 30 and 75 square miles, geotextile material shall be placed to a minimum vertical height of 5 feet above the channel bottom or to the top of the bank, whichever is less. In addition, the geotextile shall be extended to a higher elevation if needed to intercept a high water table or seepage.
  - For drainage areas over 75 square miles, geotextile material shall be placed under all the riprap.
- The armored channel cross section shall be at least as large as the adjacent stream cross sections.

Items Applicable to All Sites

Construction Drawings

- Each project shall have a plan view. This may be on an aerial photo with the site(s) shown.
- The appropriate standard drawing should be used.
- Other specific details must be shown if needed. For example, a detail of the method to be used to tie the ends of the riprap section into the existing banks may be needed.

Construction Specifications

- Notes on the standard drawings should be supplemented with appropriate construction specifications from the Iowa Field Office Technical Guide.

In general the gradation of the rock shall be such that the largest rock size is at least 1.5 and not more than 2.5 times the D50 size. The thickness of the rock layer shall be at least 1.25 times the maximum rock size. No more than 10% shall be less than 0.2 times the D50 size.

Individual rock fragments shall be dense, sound and free from cracks, seams and other defects conducive to accelerated weathering. The rock may be quarry run or shot rock and need not be sorted or mechanically sieved so long as it meets the required gradation as specified on the plans or specifications. In general, the rock should be angular in shape and in no case shall the greatest dimension be more than 3 times the least dimension.