

Chapter 3 Revetments

3-1. General

A revetment is a facing of erosion resistant material, such as stone or concrete, that is built to protect a scarp, embankment, or other shoreline feature against erosion. The major components of a revetment are the armor layer, filter, and toe (Figure 3-1). The armor layer provides the basic protection against wave action, while the filter layer supports the armor, provides for the passage of water through the structure, and prevents the underlying soil from being washed through the armor. Toe protection prevents displacement of the seaward edge of the revetment.

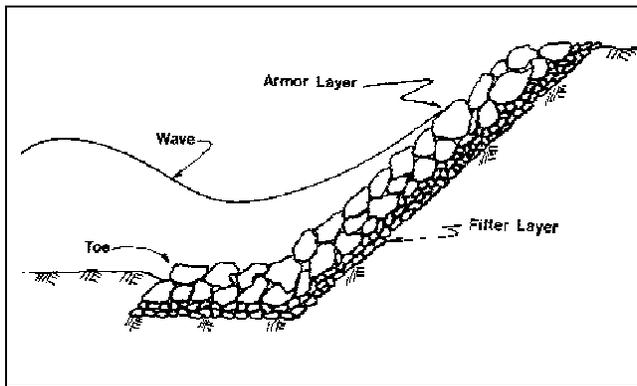


Figure 3-1. Typical revetment section

3-2. Armor Types

Revetment armoring may range from rigid to flexible types. Concrete slabs-on-grade is an example of the former, while riprap and quarrystone are examples of the latter. Rigid armors tend to be more massive but are generally unable to accommodate settlement or adjustments of the underlying materials. Flexible armor is constructed with lighter individual units that can tolerate varying amounts of displacement and shifting. Details of individual armor types are presented in Appendix B. The individual alternatives discussed in Appendix B are summarized in Figure 3-2.

3-3. Design Procedure Checklist

The usual steps needed to design an adequate revetment are:

- a. Determine the water level range for the site (paragraph 2-5).
- b. Determine the wave heights (paragraphs 2-6 to 2-11).
- c. Select suitable armor alternatives to resist the design wave (Appendix B).
- d. Select armor unit size (paragraphs 2-15 to 2-18).
- e. Determine potential runoff to set the crest elevation (paragraphs 2-12 and 2-13).
- f. Determine amount of overtopping expected for low structures (paragraph 2-14).
- g. Design underdrainage features if they are required.
- h. Provide for local surface runoff and overtopping runoff, and make any required provisions for other drainage facilities such as culverts and ditches.
- i. Consider end conditions to avoid failure due to flanking (paragraph 2-21).
- j. Design toe protection (paragraph 2-19).
- k. Design filter and underlayers (paragraph 2-20).
- l. Provide for firm compaction of all fill and back-fill materials. This requirement should be included on the plans and in the specifications. Also, due allowance for compaction must be made in the cost estimate.
- m. Develop cost estimate for each alternative.

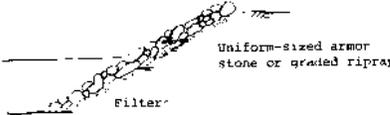
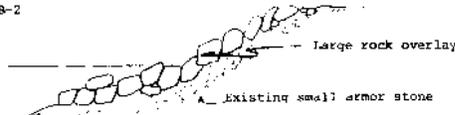
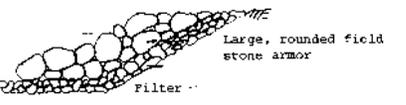
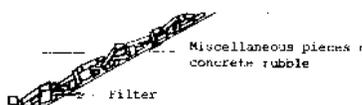
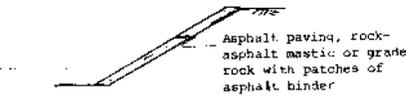
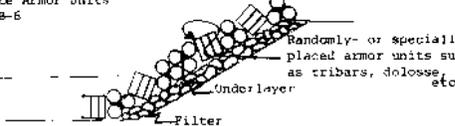
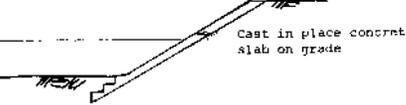
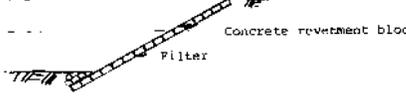
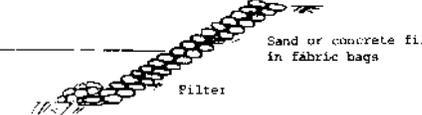
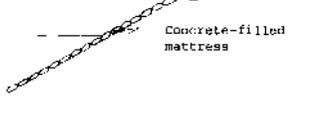
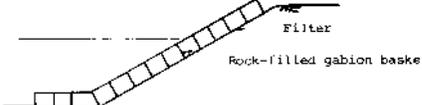
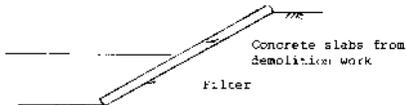
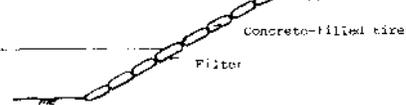
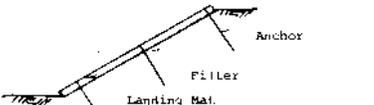
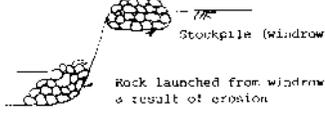
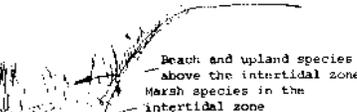
<p>Quarystone Para. B-1</p>  <p>Uniform-sized armor stone or graded riprap Filter</p>	<p>Para. B-1</p>	<p>Large Rock Overlay Para. B-2</p>  <p>Large rock overlay Existing small armor stone</p>	<p>Para. B-2</p>
<p>Field Stone Para. B-3</p>  <p>Large, rounded field stone armor Filter</p>	<p>Para. B-3</p>	<p>Broken Concrete Para. B-4</p>  <p>Miscellaneous pieces of concrete rubble Filter</p>	<p>Para. B-4</p>
<p>Asphalt Para. B-5</p>  <p>Asphalt paving, rock-asphalt mastic or graded rock with patches of asphalt binder</p>	<p>Para. B-5</p>	<p>Concrete Armor Units Para. B-6</p>  <p>Randomly- or specially-placed armor units such as tribars, dolosse, etc. Underlayer Filter</p>	<p>Para. B-6</p>
<p>Concrete Para. B-7</p>  <p>Cast in place concrete slab on grade</p>	<p>Para. B-7</p>	<p>Concrete Revetment Blocks Para. B-8 to B-16</p>  <p>Concrete revetment blocks Filter</p>	<p>Para. B-8-16</p>
<p>Bags Para. B-18</p>  <p>Sand or concrete fill in fabric bags Filter</p>	<p>Para. B-18</p>	<p>Concrete-filled Mattress Para. B-19</p>  <p>Concrete-filled mattress</p>	<p>Para. B-19</p>
<p>Gabions Para. B-20</p>  <p>Rock-filled gabion baskets Filter</p>	<p>Para. B-20</p>	<p>Steel Fuel Barrels Para. B-21</p>  <p>Gravel-filled, 55-gallon steel fuel barrels</p>	<p>Para. B-21</p>
<p>Fabric Para. B-22</p>  <p>Filter cloth fabric Sand bags or other ballast</p>	<p>Para. B-22</p>	<p>Concrete Slabs Para. B-23</p>  <p>Concrete slabs from demolition work Filter</p>	<p>Para. B-23</p>
<p>Soil Cement Para. B-24</p>  <p>Multiple layers of compacted soil-cement</p>	<p>Para. B-24</p>	<p>Tire Mattress Para. B-25</p>  <p>Concrete-filled tires Filter</p>	<p>Para. B-25</p>
<p>Landing Mat Para. B-26</p>  <p>Anchor Filler Landing Mat</p>	<p>Para. B-26</p>	<p>Windrow Para. B-27</p>  <p>Stockpile (windrow) Rock launched from windrow as a result of erosion</p>	<p>Para. B-27</p>
<p>Vegetation Para. B-28</p>  <p>Beach and upland species above the intertidal zone Marsh species in the intertidal zone</p>	<p>Para. B-28</p>		

Figure 3-2. Summary of revetment alternatives