Armourstone sizing against current attack

The loading considered here is the natural current. For the design of a revetment exposed to loadings due to ship-induced water movements the reader should refer to Section 8.3.6. The hydraulic stability of the cover layer is evaluated by means of deterministic calculations (see Section 2.3.3.3) based on a value of the design current. The water level during flooding is determined from Section 4.3.5. The current velocity and local current and shear are determined from Section 4.3.2.

The appropriate armourstone size may be determined using the widely used Izbash approach (see Section 5.2.1.4). More detailed or generalised equations are given in Section 5.2.3.1 from Pilarczyk (Equation 5.219), Escarameia and May (Equation 5.223) or Maynord (Equation 5.224). The results given by these three equations are compared in Box 5.24 indicating similar results for normal and more conservative results from Maynord and Escarameia and May for increased turbulence.

Box 8.3 discusses the differences of results for the design against current attack using these different methods.

Armourstone sizing against wave attack

The dimensioning of the upper part of the revetment against wave attack may be performed using the design method presented in Section 5.2.2:

- for a straight slope of a non-overtopped structure, see Section 5.2.2.2
- for side slopes of low-crested structures, see Section 5.2.2.4
- for crest and rear-side of marginally overtopped structures, see Section 5.2.2.11.

In general a statically stable design is preferred. Note that using wide grading armourstone, eg rip-rap, tends to increase damage (see discussion in Section 5.2.2.2). In addition, in estuarine rivers the ocean wave at the structure may be significantly oblique which should be taken into account (see Section 5.2.2.2).

NOTE: Armourstone cover layers on structures in very shallow water and gently-sloping foreshores are more vulnerable to damage than those in deeper water because of wave shape changes while travelling towards the shore (see Section 5.2.2.2), when otherwise the same wave conditions at the toe of the structure apply. As a rule of thumb, the size of the stones required for stability of the armour layer is some 10 per cent larger than that in deeper water. As a guidance for the term *very shallow water* the following may be applied: $h < 2\ H_{s\text{-}toe}$ where h is the water depth in front of the structure relative to design water level (m) and $H_{s\text{-}toe}$ is the siginicficant wave height just in front of the toe of the structure (m). Note that deep water is defined as $h > 3\ H_{s\text{-}toe}$ (see Section 5.2.2.2):

Where smaller armourstone is preferred, grouting (see Section 8.6.1) or gabions (see Section 8.6.2) may be an appropriate response and their design is also discussed in 5.2.2.7.

The design methodology is illustrated in Box 8.5 for ship-induced waves, see Section 8.3.5.2.

Step 3: Selection and specification of the cover layer material

The design value of D_{n50} being determined (see Step 2), the median mass required M_{50} can be determined by $M_{50} = \rho_r\ D_{n50}^3$ (see Equation 3.9). The appropriate grading is selected from the standard grading requirements of EN 13383:2002 (see Section 3.4.3.2). It may be necessary to use a non-standard grading for specific cases or to fit local production (see