Table 5.20 *Velocity correction factors, K_1, for water depths ($h \neq 1$ m) in the range of h = 0.3–3 m*

Depth, *h* (m)	0.3	0.6	*1.0*	1.5	2.0	2.5	3.0
K_1 (-)	0.8	0.9	*1.0*	1.1	1.15	1.20	1.25

Particularly for structures of limited length in the flow direction such as dams and sills, the vertical velocity profile is not fully developed (as was assumed in Section 4.3.2.4). Thus shear methods can be considered as a means to – but are in fact one step ahead of – the use of velocity correction factors. Use of local velocities by including a velocity factor is discussed in Section 5.2.1.8 and Section 5.2.3.

An example of a velocity-type stability criterion is given in Box 5.10.

Box 5.10 *Velocity-type stability criterion for stones on a sill*

A well-known example of a velocity-type stability criterion was presented by Izbash and Khaldre (1970). Their empirically-derived formulae for exposed and embedded stones **on a sill** are given as Equations 5.120 and 5.121 respectively.

NOTE: Izbash and Khaldre (1970) defined u_b as the critical velocity for stone movement (m/s), which can be interpreted as the velocity near the stones and not as the depth-averaged flow velocity, *U* (m/s).

Exposed stones:

$$\frac{u_b^2/2g}{\Delta D_{50}} = 0.7 \qquad (5.120)$$

Embedded stones:

$$\frac{u_b^2/2g}{\Delta D_{50}} = 1.4 \qquad (5.121)$$

where D_{50} is the median sieve size (m).

Range of validity: Equations 5.120 and 5.121 as developed by Izbash and Khaldre (1970) are valid for relative water depths, *h/D*, in the range of *h/D* = 5 to 10.

Another (quasi-) velocity method implies an assumption of a critical shear stress, ψ_{cr}, and then a transfer of this critical shear stress into a critical velocity. The method is based on logarithmic fully-developed velocity profiles (Section 4.3.2.4) and is discussed in Section 5.2.1.8.

In the complicated case of a non-fully developed velocity profile, the local maximum near-bed velocity has to be measured (or otherwise estimated by assuming a reasonable velocity profile, Section 4.3.2.4). This velocity is then substituted into Equations 5.104 and 5.123.

Application of correction factors

All correction factors introduced in this section and in Section 5.2.1.3, except for k_t, originally refer to shear stresses, τ or ψ. The turbulence factor, k_t, refers to velocities, U.

The **resistance** of a bed is represented by shear stress, τ_{cr} or ψ_{cr}, or velocity, U_{cr}, while the **actual loading** is expressed as τ or ψ (shear stress) or U (velocity).

The general relationship between shear stress and velocity can be written as: $U \propto \sqrt{\tau}$ or as: $\tau \propto U^2$. Therefore, in some stability formulae (see Section 5.2.3.1), the k-factors appear in principle in the combinations $k\tau$, $k\psi$ or $\sqrt{(kU)}$, except for k_t, which appears as $k_t^2\tau$, $k_t^2\psi$ or k_tU.

NOTE: With regard to the remaining hydraulic parameters that may be applied in a stability analysis (H and q, described at the beginning of this Section 5.2.1), it should be noted that $H \propto U^2$ and $q \propto U$. Consequently, correction factors, k, should be applied accordingly: for the resistance (slope) reduction factors, eg k_{sl} , applied to any hydraulic design parameter, for example τ_{cr} or U_{cr}^2, generally $k_{sl} \leq 1$, whereas for the load amplification factors (k_w, k_t), $k \geq 1$.