* = New in this version dated 5 December 2017: **page xxxii, xxxiii (twice), 173, 218, 253, 260, 280 (twice), 287, 323, 373, 411, 437, 440, 442 (twice), 455, 530, 532, 533, 535, 536, 545, 547, 548, 555, 577, 598, 617 (3 items), 618, 623, 639, 650, 654, 661, 721 (correction), 726, 745 (3 items), 746, 746 (addition), 748, 852, 892, 1008 (twice), 1033, 1034, 1103, 1107, 1108, 1122, 1142, 1146 (correction), 1187.**

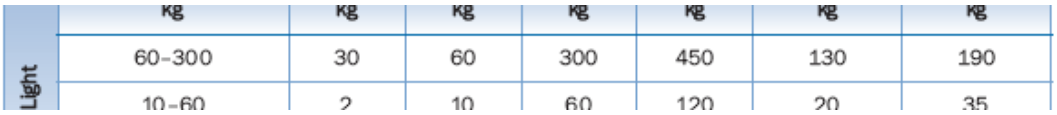
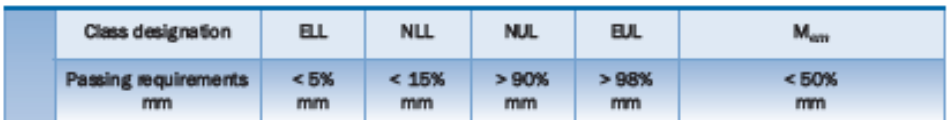
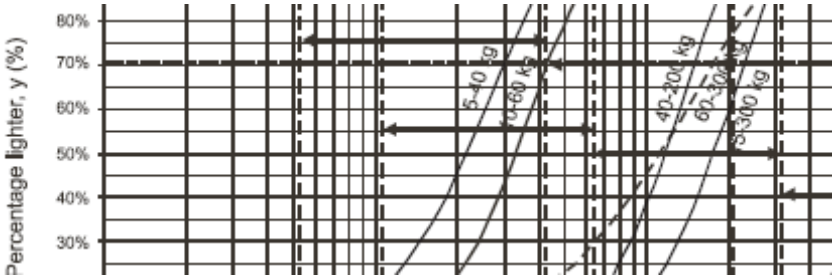
Notes:

(i) This list refers to the original (hard copy) Manual of 2007. A few Figures are correct on the CD and on the PDFs as made available on the websites of CIRIA (www.ciria.org) and TU Delft (www.dicea.nl), but not correct on the hard copy pages, see below.

(ii) In 2012 a reprint in b/w has been issued, which unfortunately does not include all corrections of the list of errata of December 2011, as mentioned in that version. A separate list for that b/w version dated 2012 is published, including all errata since the issue of that version.

Page No	Erratum / Correction
xxvii	**Incorrect definition of (notation) of D_{n50}:** 'Median' (being the middle number) is not the correct statistical value, to be deleted D_{n50} Median nominal diameter, or equivalent cube size, $D_{n50} = (M_{50}/\rho_{app})^{1/3}$ D_s Diameter of ship propeller; diameter of pipe The definition of D_{n50} has to read: "Nominal stone diameter, …". **Notes**: 1. This erratum referring to D_{n50} is on numerous places in the Manual and therefore restricted to this one, without cross references to all pages concerned. 2. The word "median" is in many instances in the main text also added to the (definition of the) sieve size D_{50}. Also this is incorrect, as this value is defined by the 50% value of the total mass, being 50% of the sieve curve, as defined on page xxviii. 3. The same applies to (the definition of) M_{50}. As this value is also defined by the 50% value of the total mass (see page xxx), the word "median" should be ignored in those instances.
xxxiii	**Ambiguous guidance of notation Δ** "Δ Relative buoyant density of " has to read: "Δ Relative submerged density of ". **Note:** this erratum is also on the following pages: 96 ,129, 438, 527, 537, 539, 546, 563 [3x], 564, 567, 570 [2x], 572, 580, 588, 602, 603, 604, 607, 609, 611, 616, 617 [2x], 626, 633, 649, 650, 651, 890, 924, 949, 1034, 1060, 1104, 1105, 1263.
xxviii	**Notation e_{sp}**: incomplete description / definition e_{sp} Ratio of the head loss in a river between two spur-dikes "Ratio of .. spur-dikes" to be substituted by: "Spur ratio, defined as the ratio of the head loss in a river between two successive spur-dikes, $U^2 S_{sp}/(C^2 h)$, and the velocity head, $U^2/(2g)$"
xxxii *	**Notation s_o**: incorrect definition, T_m has to read T s_o Fictitious wave steepness, defined as $H_s/L_o = 2\pi H_s/(gT_m^2)$ The correct definition is: $s_o = 2\pi H_s/(gT^2)$

Page No	Erratum / Correction
xxxiii *	**Notation *WA***: incorrect definition; see also page 96 *WA* Water absorption, $WA = (\rho_w/\rho_{rock})\, p/(1-p)$ The correct definition is: $WA = M_w/M_{rock} = (\rho_w V_P)/(\rho_{rock} V_T) = (\rho_w/\rho_{rock})\, p$
xxxiii *	**Notation: additional parameter, below β = horizontal slope**: β_{Iz}; see also page 654 β_{Iz} Stability factor in the formula, based on Izbash, for the evaluation of the stability of armourstone subject to ship-induced currents (Equation 5.226)
92	**9th line from below:** Incorrect reference (year) supplementary full-scale integrity testing of armour stones (Dupray *et al* (2003), see Section 3.8.5) will greatly increase confidence in assessing the relative suitability of several nearby "Dupray et al (2003)" → "Dupray et al (2004)"
96	**5th line from below**: typographic error in Equation 3.2 $WA = (\rho_w/\rho_{rock}) \cdot p/(1-p)$ (3.2) "/(1-*p*)" to be deleted. The Equation has to read: $WA = (\rho_w/\rho_{rock})\, p$
97	**1st line:** error in Equation 3.3 $\rho_{app} = \rho_{rock} \cdot (1-p) + \rho_w \cdot p \cdot S_r$ (3.3) "(1-*p*)" to be deleted. The Equation has to read: $\rho_{app} = \rho_{rock} + \rho_w\, p\, S_r$
97	**6th line from above:** a typographic error Hudson and Van der Meer (see Section 5.2.2.2), has traditionally been assumed to be the *saturated surface dry* mass density (ie ρ_{rock}) as it was considered the most applicable density "(ie ρ_{rock})" to be deleted.
99	**4th line from below:** an omission Integrity is a property of heavy armourstone, among others such as shape characteristics, that may be evaluated by initial type tests, ie one-off tests giving information about an "a property of heavy armourstone" → "a property of heavy and light armourstone"
104	**Section 3.4.1.6 – 6th line:** typographic error • heavy armourstone in cover layers typically < 5 per cent • light armourstone in cover layers (< 40 kg) typically < 20 per cent. "(< 40 kg)" in the second bulleted line to be deleted.

Page No	Erratum / Correction
110	**Table 3.5: 3rd row of light gradings part:** typographic error  The lower limit of M_{em} for the 60-300 grading: "130" has to read: "120".
110	**Table 3.5: Heading of last column of coarse grading**  "M_{em}" to be deleted.
111	**Figure 3.20, middle figure for light armourstone:** incorrect line indication  The dashed line refers to 15-300 kg instead of 60-300 kg. The line to the right refers to 60-300 kg instead of 15-300 kg.
113	**Equation 3.14:** typing error in the second equation $$M_{50} \cong NLL\left(\frac{\ln(1-y_{NLL})}{-0.693}\right)^{-1/n_{RRM}} \qquad M_{50} \cong NLL\left(\frac{\ln(1-y_{NUL})}{-0.693}\right)^{-1/n_{RRM}} \qquad (3.14)$$ The right end equation has to read (*NUL* instead of *NLL*): $$M_{50} \cong NUL\left(\frac{\ln(1-y_{NUL})}{-0.693}\right)^{-1/n_{RRM}}$$
115	**5th and 6th line from below:** incorrect guidance of a D_{n50} value calculated from D_{50} ($D_{n50} = 0.84D_{50}$) specified in Table 3.6, column (b). This is a conservative approach since in most cases the delivered material will have a greater D_{50}. The sentence "This is a conservative … D_{50}." has to read: "This is, however, not a conservative approach since in most cases the delivered material will have a smaller D_{50}."
116	**Table 3.6, 8th row of 'Light and heavy' part:** typographic error  "162" in the 3rd column → "149"

Page No	Erratum / Correction
119	**First line:** typographic error, as there does not exist a Cat A spec for coarse gradings: "for Category A specification" to be deleted. **Size distribution similar to standard gradings for Category A specification – detailed approach for coarse gradings** "**gradings for Category A specification – detailed** " → "**gradings – detailed** "
124	**6th line from below:** typographic error **NOTE:** The volume of rock, V_r, should not be confused with the volume of armourstone, which is V_b. The only practical possible use of V_r is as an input to determine the mass of rock, $\rho_{app} M_r = \rho_{app} \times V_r$ which is also the total mass of armourstone. "$\rho_{app} M_r = \rho_{app}$ x V_r which is "→ "$M_r = \rho_{app}$ x V_r , which is "
138	**Table 3.13:** typing error in last column (=4) (=3) (=2) (=1) Average % {(c) × (d)}/ mean of (d) Lithological classification √ 3 58 2.12 Regional *in situ* stress √ 2 73 1378 Weathering grade √ 3 73 2.67 "1378" in the last column → "1.78"
139	**35th line:** typographic error "Dupray et al, 2003)" has to read: "Dupray et al, 2004) "
144	**Table 3-14:** typing error in the X_2-row X_2 | Grading width $(M_{85}/M_{15})^{1/3}$ | 1.1–1.4 | 1.5–2.4 | 2.5–2.4 Rating | 1.2 | 1.0 | 0.5 "2.5-2.4"in the 5th column should read: "2.5-4.0"
147	**8th line of Section 3.6.6: incorrect reference (year)** stockpiling and loading. Dupray *et al* (2003) observed in each case a mass of small fragments, say smaller than 100 kg, totalling 5–8 per cent of the initial consignment and that the initial "Dupray et al (2003)" → "Dupray et al (2004)"

Page No	Erratum / Correction
165	**Equations 3.54 and 3.55 in Box 3.14: typographic errors:** $M_{T(Sr=0)}$ in the last term is incorrect, as $\rho_w V_H = M_{T(Sr=0)} - M_H$ (Archimedes law) **Apparent mass densities are determined as follows:** $\rho_{app(Sr=0)} = M_{T(Sr=0)}/V_{TG} \cong M_{T(Sr=0)}/V_{TH} \cong \rho_w \times M_{T(Sr=0)}/[M_{T(Sr=0)} - M_H]$ (3.54) $\rho_{app(Sr=1)} = M_{T(Sr=1)}/V_{TG} \cong M_{T(Sr=1)}/V_{TH} \cong \rho_w \times M_{T(Sr=1)}/[M_{T(Sr=0)} - M_H]$ (3.55) The Equations have to read: Eq. 3.54: $\rho_{app(S_r=0)} = M_{T(S_r=0)} \big/ V_{TG} \cong M_{T(S_r=0)} \big/ V_{TH} \cong \rho_w \times M_{T(S_r=0)} \big/ \lfloor M_{T(Sr=1)} - M_H \rfloor$ Eq. 3.55: $\rho_{app(S_r=1)} = M_{T(S_r=1)} \big/ V_{TG} \cong M_{T(S_r=1)} \big/ V_{TH} \cong \rho_w \times M_{T(S_r=1)} \big/ \lfloor M_{T(Sr=1)} - M_H \rfloor$
165	**Equation 3.59:** a typographic error, parenthesis to be deleted and the parentheses not in italic typeface $p = [M_{T(Sr=1)} - M_{T(Sr=0)}]/[M_{T(Sr=1)}) - M_H]$ for hydrostatic measurement of the volume (3.59) The correct Equation 3.59 is: $p = \lfloor M_{T(Sr=1)} - M_{T(Sr=0)} \rfloor / \lfloor M_{T(Sr=1)} - M_H \rfloor$
173 *	**Box 3.18: 6th line below Table 3.23:** Typing error, D_f i.s.o. D_p integrity ranking based on values of both the degree of fissuration, D_p (%), and the continuity index, I_c (%), are given in Table 3.24. "the degree of fissuration, D_p (%)" → "the degree of fissuration, D_f (%)
193	**Notes to Figure 3.53**: typing error n_{RRD} is the uniformly coefficient of the size distribution curve, Section 3.4.3.3 **Figure 3.53** *Illustration of theoretical scenarios for an aggregates blast and an armourstone blast* "uniformly coefficient" → "uniformity coefficient"
216	**Box 3.29: 7th and 9th line:** Typographic errors in the numbering of Tables attention should be paid to the organisation of the stocks to minimise the travelling distances. Table 3.31 provides the appropriate size of machine and experience of outputs. **Table 3.31** *Relationship between the appropriate machine capacity (t) and size of stone to be* "Table 3.31" → "Table 3.30"

Page No	Erratum / Correction
216	**Same Box 3.29; 5th line above Table 3.32 + caption:** incorrect Table number Table 3.32 gives an example of how to prepare a quality control guide table for a 6–10 t grading with M_{50} between 8.5 t and 7.5 t. The last two columns can be used as a grading plan for 1000 t used by the machine driver when loading the trains, barges or trucks. The operator keeps a record of the number of pieces loaded from each sub-class and once or twice a day a grading curve is plotted. If sizes are drifting off target grading curves, future loads can be adjusted. **Table 3.32** *Heavy grading quality control plan* "Table 3.32" → "Table 3.31"
218	**Caption of Table 3.30 and 1st line above the Table:** incorrect Table number to handle the larger stones. Constraining the maximum feed size and the smallest mesh or hole opening will generally prevent damage. Typical limitations are given in Table 3.30. **Table 3.30** *Limitation of screening device to limit damages* "Table 3.30" → "Table 3.32"
218 *	**Table 3.32 (i.e. corrected Table number)**: typographic error: kg → mm **Table 3.30** *Limitation of screening device to limit damages* The maximum feed size should be "120 mm" i.s.o. "120 kg"
239	**Table 3.40:** typographic error, incorrect unit The unit "(kg)" has to read: "(mm)"
253 *	**Table 3.46, Equation 3.90:** typing error, "n" → "N_a" Armour layer porosity $n_v = 1 - \frac{nV}{At_a} = 1 - \frac{k_s^{2/3}}{X_c Y_c k_t} = 1 - \frac{1}{X Y k_t}$ (3.90) The first part of the correct formula reads: $n_v = 1 - \frac{N_a V}{A t_a}$
258	**Caption of Figure 3.94:** incorrect acknowledgement **Figure 3.94** *Example of Tetrapods used as armour on breakwater with crown wall (courtesy Sogreah)* "Sogreah" to read: "M Scott"

Page No	Erratum / Correction
260 *	**Table 3.47:** ambiguous guidance for cubes in two layers

Table 3.47 *Characteristic geometric and armour layer parameter values of randomly placed concrete armour units*

Armour unit type	Size (m^3)	Layer coefficient k_t (–)	Shape coefficient k_s (–)	Distance between units: Horizontal $\Delta x/D_n$ (–)	Distance between units: Slope-parallel $\Delta y/D_n$ (–)	Porosity n_v (–)	Packing density coefficient ϕ (–)	Modified layer coefficient k_c	Recommended slope cot α (–)
Cube (two layers)		1.10	1.0	~~1.70~~	~~0.85~~	0.47	1.17	1.10	

The distances between units [i.e. 1.70 and 0.85] need to be deleted, as this type of CAU's are randomly placed.

280 *	**First line above subsection 3.15.2.1**: unclear cross reference, and **3rd / 4th line of subsection 3.15.2.1**: unclear guidance as total percentage > 100%

found in the TAW *Technical report on the use of asphalt in water defences* (TAW, 2002).

3.15.2.1 *Asphaltic concrete*

Asphaltic concrete is a continuously graded mixture of crushed stone or gravel, sand and filler in which the pores (voids) are almost entirely filled with bitumen. The mixture usually consists of crushed stone or gravel (50 per cent), sand (42 per cent), filler (8 per cent) and bitumen (6.5 per cent).

- "(TAW, 2002)" has to read: "(TAW, 2002b)"
- "(6.5 per cent)" has to read: "(6.5 per cent of the total of mass of gravel, sand and filler)"

284	**Caption of Figure 3.111:** typographic error

Figure 3.111 *Non-woven geotextiles (courtesy Ten Cate)*

"*Non-woven*" → "*Woven*"

287 *	**Third line from above:** typing error

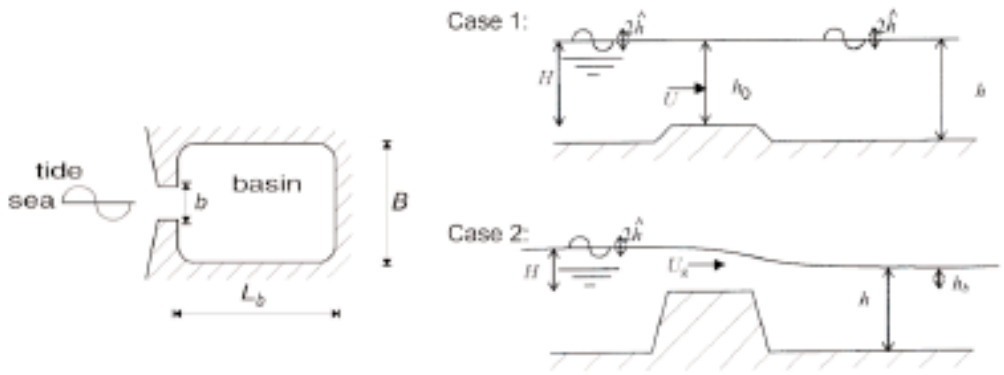
Where the geotextile is expected to be experience high load and prevent spreading or slip failure of the embankment, there is a requirement for high tensile strength with low

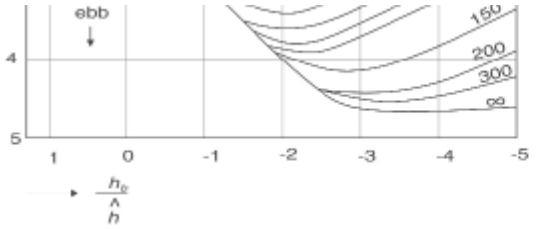
"to be experience" has to read: "to experience".

323 *	**7th line / 4th bullet of section 4.2.2:** incorrect guidance / typing error

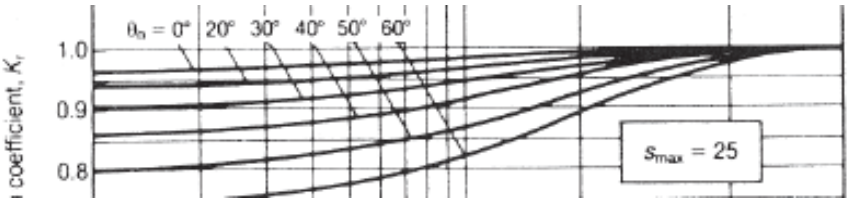
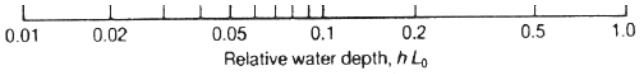
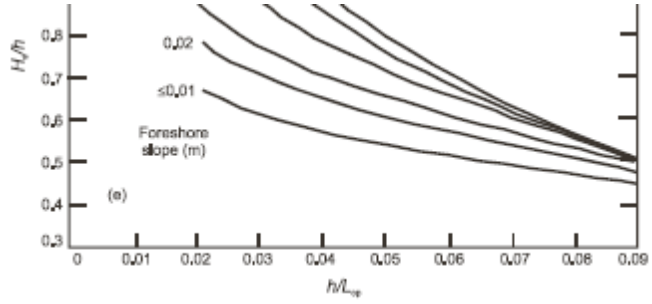
- a structure may be exposed (and possibly vulnerable) to different risks for different water levels, in turn dependent upon SWL

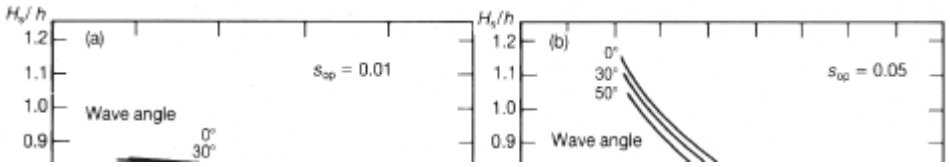
"upon SWL" has to read: "upon MWL (Mean Water Level)"

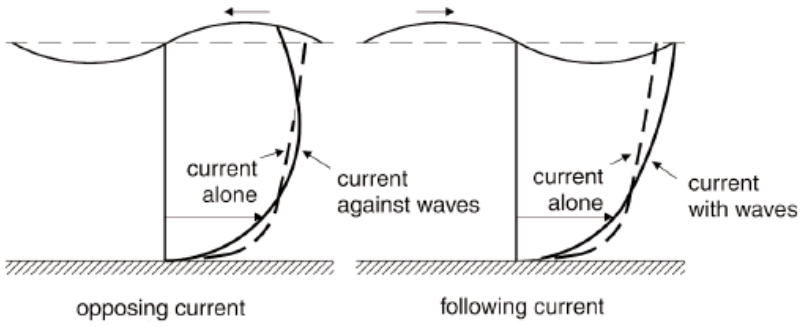
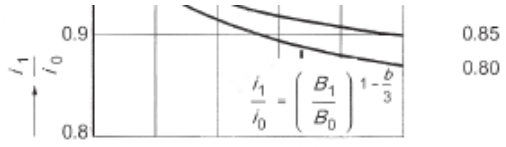
Page No	Erratum / Correction
326	**Equation 4.9:** this is mistakenly a copy of Equation 4.10 For open water domains, Equation 4.9 gives the relationship between the **static** rise in water level z_a (m) and the corresponding atmospheric pressure: $$\frac{\partial \eta}{\partial x} = \frac{1}{\rho_w g d} \tau_w \qquad (4.9)$$ Equation 4.9 has to read: $z_a = 0.01(1013 - p_a)$
332	**2nd line below Equation 4.24:** reference year for Kamphuis $$\frac{(H_{m0})_{LW}}{H_{s,b}} = 0.11 \left[\frac{H_{s,b}}{g T_p^2} \right]^{-0.24} \qquad (4.24)$$ Equation 4.24 can be approximated as a rule of thumb by $(H_{m0})_{LW} = 0.4 H_{s,b}$. Kamphuis (2000) also addresses the problem of reflection of these long waves on coastal structures, "Kamphuis (2000)" → "Kamphuis (2001)"
343	**Figure 4.18:** typing error  Note: b is affected by horizontal closure while h_0 is affected by vertical closure. **Figure 4.18** *Definition sketch of basin model* Lower right figure (Case 2): "U_g" → "U_0"
343	**Line above Equation 4.30:** typing error In the case of a sinusoidal tide of amplitude h, Equation 4.29 becomes Equation 4.30: $$Q(t) = \frac{2\pi}{T} B L_b \hat{h} \sin\left(\frac{2\pi t}{T} \right) \qquad (4.30)$$ "amplitude h" → "amplitude $\hat{h}$"

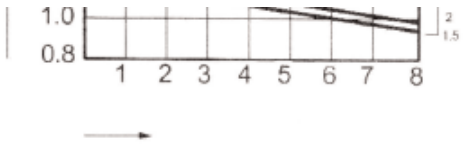
Page No	Erratum / Correction
344	**Text of caption to Figure 4.19:** ambiguous definition  **Figure 4.19** *Design graph for maximum velocity; note that h_b should read h_0, the water depth (on the sill) in the closure gap* "*the water depth (on the sill)*" → "*the sill level relative to mean water level*"
350	**Fourth line:** the symbol ω to be in italic type propagation velocity of energy (**group velocity**) is given by $c_g = \partial\omega/\partial k$ (m/s). In linear wave theory, based on Equation 4.38, the expressions for phase and group velocity are given by "$c_g = \partial\omega/\partial k$ (m/s) " → "$c_g = \partial\omega/\partial k$ (m/s) "
351	**Table 4.6:** the symbol ω to be italicized Wave number k (rad/m) | $k = \omega/\sqrt{gh}$ "$k = \omega/\sqrt{gh}$ " → "$k = \omega\sqrt{gh}$ "
352	**Line below Equation 4.44** When the deep-water wave length, H_o, is used instead of H, this number is denoted ξ_o or Ir_o. "wave length, H_o" → "wave height, H_o"
356	**Line above Figure 4.27:** a mistake, the Figure is not on linear-log scale Figure 4.27 shows (on linear-log scale) the Rayleigh distribution.  "(on linear-log scale)" to delete
357	**Equation 4.54:** factor mistakenly not included and mathematical operator 'erfc' in Italic type $\frac{H_{1/Q}}{H_{rms}} = Q\,erfc\left(\sqrt{\ln Q}\right) + \sqrt{\ln Q}$, with: $erfc(x) = \int_x^{+\infty} \exp(-t^2)\,dt$ (4.54) The correct equations are: $\frac{H_{1/Q}}{H_{rms}} = \frac{\sqrt{\pi}}{2} Q\,\mathrm{erfc}\left(\sqrt{\ln Q}\right) + \sqrt{\ln Q}$, with $\mathrm{erfc}(x) = \frac{2}{\sqrt{\pi}} \int_x^{+\infty} \exp\left(-t^2\right) dt$
361	**3rd line from below:** typographic error (incorrect x-reference) The relationship between T_p and $T_{m-1,0}$ can be obtained by numerical evaluation of Equation 4.62 if the analytical expression of the variance spectrum $E(f)$ is known. Dingemans (1987) "4.62" → "4.61"

Page No	Erratum / Correction
364	**Reference year for Aono and Goto in Box 4.5** Box 4.5 *Modified JONSWAP spectra compatible with a f-4 high-frequency tail* Modified JONSWAP spectrum as proposed by Donelan *et al* (1985) with input variables U_{10} and F or m_0 and T_p — Modified JONSWAP spectrum as proposed by Aono and Goto (1994) with input variables $H_{1/3}$ and $T_{1/3}$ "Aono and Goto (1994)" → "Aono and Goto (1995)"
365	**9th line from above:** typographic error, pi not in italic font! where: $\omega_h = 2\pi f\sqrt{h/g}$. $\omega_h = 2\pi f\sqrt{h/g}$ has to read: $\omega_h = 2\pi f\sqrt{h/g}$
367	**18th line (from above):** incorrect cross-reference The mean energy period, $T_{m-1,0}$, has recently been observed to be a better and more stable characteristic period for stability design formulae (see Section 4.2.4.5). Equation 4.63 gives a practical relationship to estimate $T_{m-1,0}$ from T_p. "Equation 4.63" → "Equation 4.62"
373	**Equation 4.89:** is not the correct Equation $$\frac{g t_{min}}{U_{10}\cos(\theta-\phi_w)} = 30.1\left(\frac{g F_\theta}{\left(U_{10}\cos(\theta-\phi_w)\right)^2}\right)^{0.77} \quad (4.89)$$ This Equation has to read: $$\frac{gF_\theta}{\left(U_{10}\cos(\theta-\phi_w)\right)^2} \le 9.47\cdot 10^4$$
373	**Equation 4.93**: left hand side is incorrect: U_{10} instead of U_{10}^2 $$\frac{gT_p}{U_{10}^2} = 7.519\left(\tanh A_2 \tanh\left(\frac{B_2}{\tanh A_2}\right)\right)^{0.37} \quad (4.93)$$ This Equation has to read: $$\frac{gT_p}{U_{10}} = 7.519\left(\tanh A_2 \tanh\left(\frac{B_2}{\tanh A_2}\right)\right)^{0.37}$$
373 *	**5th line from below**: typing error Both these parameters are present is the above formulae. Later Young (1997) observed that these formulae fail to correctly ... "present is" has to read: "present in"

Page No	Erratum / Correction
376	**Figure 4.34:** typographic mistakes in the symbols in the Figure  "θ_0" to read: "β_o" [three times] and "K_r" to read: "K_R"
376	**Figure 4.34:** typographic errors in label to x-axis and in the caption  Note: s_{max} is a parameter used to describe directional spreading. Goda (1985) suggests the following values: i) Wind waves: s_{max} = 10 ii) Swell with short decay distance: s_{max} = 25 (with relatively large wave steepness) **Figure 4.34** *Retraction coefficient, K_R, for an irregular directional wave field* 1. label to x-axis: "$h\ L_0$" to read: "h/L_o" 2. caption: "Retraction" to read: "Refraction"
381	**Equation 4.100 in Box 4.7:** typographic errors ($H \rightarrow h$, and pi not in Italic font) $H/L \le [H/L]_{max} = 0.14 \tanh(2\pi\ H/L)$ (4.100) The correct Equation reads: $$H/L \le [H/L]_{max} = 0.14 \tanh(2\pi h/L)$$
381	**Figure 439**: typographic errors in legend  "Goca" hast o read: "Goda"; and "Batties" hast o read: "Battjes"
382	**Figure 4.40:** incorrect label to the y-axis (5 times)  The label "H_s/h" has to read (cf Box 4.8): "H_{m0}/h".

Page No	Erratum / Correction
383	**Figure 4.41:** incorrect label to the y-axis (2 times)  The label "H_s/h" has to read (cf Box 4.8): "H_{m0}/h".
384	**Box 4.9 – 6th line from below:** typographic errors Goda (2000) advises that this numerical formula may overestimate wave heights by several per cent. In particular, for waves of steepness greater than 0.04, the formulae overestimate significant wave heights "this numerical formula" → "these numerical formulae"
384	**Same box 4.9, last line of Table 4-14:** typographic error (index 'max' in italic) $\beta_{\max} = \max\left\{0.92, 0.32(H'_0/L_o)^{-0.29}\exp(2.4m)\right\}$ β^*_{max} $\beta_{\max}$ has to read: β_{max}
388	**Equation 4.109 in Box 4.10:** typographic error (X → x) Log-normal $p(X) = \frac{1}{aX\sqrt{\pi}}\exp\left[-\left(\frac{\ln(X)-b}{a}\right)^2\right]$ (4.109) The correct Equation reads: $$p(x) = \frac{1}{a\,x\sqrt{\pi}}\exp\left[-\left(\frac{\ln(x)-b}{a}\right)^2\right]$$
411 *	**Box 4.13, 6th line of 4th bullet text:** incomplete wording itation runs off. The gradex thus makes it possible to extrapolate the distribution of discharges beyond the usual limiting return period. "The gradex thus" has to read: "The gradex method thus"
417	**Equation 4.139:** this is not the correct Equation $i = U_1^2/\left(R_1 C_1^2\right) = U_2^2/\left(R_2 C_2^2\right) = U^2/\left(R\,C^2\right)$ (4.139) This Equation has to read: $$n = P\,R^{5/3}/\left(P_1\,R_1^{5/3}/n_1 + P_2\,R_2^{5/3}/n_2 + \ldots + P_N\,R_N^{5/3}/n_N\right)$$
417	**Equation 4.143:** typographic error $\sqrt{R} = \left(A_1\sqrt{R_1}C_1 + A_2\sqrt{R_2}C_2\right)/(AC)$ (4.143) The correct Equation reads:

Page No	Erratum / Correction
	$$\sqrt{R} = \left(A_{c1}\sqrt{R_1}C_1 + A_{c2}\sqrt{R_2}C_2\right) / \left(A_c C\right)$$
421	**Figure 4.62:** printing mistake (**only in the hard copy!**) The correct Figure (copy from CD and PDF version) is as below:  **Figure 4.62** *Effect by waves on the velocity profile*
423	**Paragraph above Figure 4.65:** incorrect guidance The result of the curved flow is a higher water level in the outer bend compared with the water level in the inner bend. The flow velocity is increased near the inner part of the bend because of the larger gradient of the longitudinal water surface and the smaller water depth. Therefore, the flow velocity is largest near the inner part of the bend. mean level dr water surface **New text block for the paragraph**: The result of the curved flow is a higher water level in the outer bend than in the inner bend, because of the centrifugal force acting on the water in the upper part of the stream. The streamlines near the bed are directed towards the inner bend. Due to movement of sediment to the inner bend by these near-bed currents, the depth, h (m), in the outer bend is larger than that in the inner bend. Consequently, the resistance (ie a higher C-value) is less in the outer bend. As a result, the flow velocity, v (m/s), in the outer bend is higher than in the inner bend, $v = C\sqrt{(h\,i)}$.
424	**A Note to be added after last line of the page** **"NOTE:** Combining Equation 4.157 (+ 4.156) with Equation 4.154 [using $Q = B\,U\,h$] will give the equation in the upper part of Figure 4.67. Combining this 'upper' equation with Equation 4.155 (considering Equation 4.154) will give the equation in the lower part of Figure 4.67. "
425	**Figure 4.67:** the power part of the equation in lower part is incorrect  **Figure 4.67** ***Consequences of a horizontal river constriction for the equilibrium river depth*** The equation in the lower part of the Figure has to read: $$\frac{i_1}{i_0} = \left(\frac{B_1}{B_0}\right)^{1-\frac{3}{b}}$$

Page No	Erratum / Correction
428	**Figure 4.69:** label to x-axis is missing  **Figure 4.69** *Shear stress, transverse distribution (after 1995 edition)* The label to the x-axis (to be inserted just to the right of the arrow) reads: *B*/*h*
435	**15th line from below:** incorrect, ambiguous guidance • ship position, relative to the fairway axis y (m) or bank y_s (m) The position reference for y differs from that of y_s; the text has to read: " • ship position, relative to the fairway axis y (m), between axis and ship's centre line, or to the bank y_s (m), between ship's hull and the bank "
437	**Equation 4.171**: typographic error $V_s - f_v V L$ (4.171) where f_v = 0.9 for unloaded ships and f_v = 0.75 for loaded ships. The equation has to read: $V_s = f_v V_L$
437 *	**1st line of step 5 / 1st line above Eq. 4.175**: incorrect dimensions indication 5 **Maximum water level depression, $\Delta\hat{h}$ and return flow, $\hat{U}_r$** The maximum water level depression, $\Delta\hat{h}$ (m/s) can be calculated by Equation 4.175: "(m/s) can be" has to read: "(m) can be"
438	**1st line above Equation :** incorrect guidance where $z_0 = 0.16\, y_s - c_2$, $y_s = 0.5\, b_w - B_s - y$, $c_2 = 0.2$ to 2.6. $u_{max} = V_s\left(1 - \Delta D_{50}/z_{max}\right)$ (4.181) The definition of y_s has to read (see also erratum above for page 435, ship position): $y_s = 0.5 b_w - 0.5 B_s - y$
440 *	**Line above subsection 4.3.4.3:** typing error α_i = 1 for unloaded push units. ***4.3.4.3 Propeller jet velocities*** The value of the coefficient α_i for unloaded pus units has to be: 0.5 (i.s.o. 1)
441	**Equation 4.187:** typographic error, i.e. additional parentheses needed $u_{p,0} = 1.15\left(P/\rho_w D_0^2\right)^{1/3}$ (4.187)

Page No	Erratum / Correction
	This Equation has to read: $u_{p,0} = 1.15\left(P/\left(\rho_w D_0^2\right)\right)^{1/3}$
441	**Equation 4.190:** as it was, it was only valid for non-sailing ships with single propellers; therefore, a factor to be added and a term for sailing ships; and a Note to be added Maximum bed velocity along horizontal bed (see Equation 4.190): $u_{p,\max bed} = c\, u_{p,0}\left(D_0/z_p\right)^n$ (4.190) - This Equation 4.190 has to read: $u_{p,max,bed} = f_n\, c\, u_{p,0}\left(D_0/z_p\right)^n - 0.5V_s$ - Definition of z_p (19th line from below) has to read: "z_p = distance between the propeller axis and the bed for a non-sailing ship (m)." - To be inserted just above the 18th line from below: "**NOTE**: Equation 4.190 is valid for ships with one and more than one propeller. In the case of more than one propeller, the applied power per propeller has to be used (in Equation 4.187) and the factor f_n in Equation 4.190 is equal to $\sqrt{n_p}$, where n_p is the number of propellers."
441	**15th line:** typing error: A wide range of values for the empirical coefficients *a*, *b*, *c*, *m* and *n* in Equations 4.187 to 4.190 is available because different researchers have taken into account different influences "4.187 to" → "4.188 to"
442 *	**First to 5th line below Figure 4.87:** ambiguous and incorrect guidance The calculated propeller jet velocities can be used with Equation 5.226 in Section 5.2.3.1 for the design of armourstone bed and slope protection against propeller jet attack. This equation includes a turbulence factor, k_t^2 (see also Section 4.3.2.5) to take into account turbulence levels, as the propeller jet velocities given by Equations 4.187 to 4.190 are time-averaged velocities and stability is determined by turbulent peak velocities. As the turbulence factor in the Equation 5.226 has been adapted / changed (see erratum page 654), the text in this paragraph has to be changed as follows: "a turbulence factor, k_t^2 (see also Section 4.3.2.5) to take into account " has to read: "a specific turbulence factor, β_{lz}, to take into account "

Page No	Erratum / Correction
442 *	**Second paragraph below Figure 4.87:** ambiguous and incorrect guidance Different values of the turbulence factor for propeller jets can be found in literature. It is important that the value for the turbulence factor is selected in combination with the value for the coefficient c in Equation 4.190 (and thus a, b and m). PIANC (1987) presents for the turbulence coefficient a value that can be converted into: $k_t^2 = 5.2$. Design experience has shown that this value for the turbulence coefficient together with $c = 0.3$ can be used for cases when vessels are often not fully loaded and the berthing position is not always the same. If the maximum impact of the propeller jet occurs frequently and always at the same place (ro-ro and ferry) a value of $k_t^2 = 6$ is recommended together with $c = 0.3$. With reference to the erratum given above, parts of the text of this paragraph have to be changed as follows: - "in combination with the value for the coefficient c in Equation 4.190 (and thus a, b and m)." has to read: "in combination with both the equation used to evaluate stability and the value for the coefficient c in Equation 4.190 (and thus a, b and m)." - "converted into $k_t^2 = 5.2$." has to read: "converted into $\beta_{Iz} = 2.6$; see also Equation 5.226 (Section 5.2.3.1). " - "a value of $k_t^2 = 6$ is recommended " has to read: "a value of $\beta_{Iz} = 3$ is recommended "
442	**Equation 4.191:** additional guidance to prevent mistakes: power P (W) (see also PIANC currently in preparation for publication). $$D_p = 0.0133P^{0.365} \qquad (4.191)$$ To be inserted below the Equation: **"NOTE**: Although not common practise when working with engine power, the dimension of the power to be used in Equation 4.191 is Watt (W), not kilowatt (kW). The PIANC report presents the equation based on kW: $D_P = 0.164P^{0.365}$, which is essentially the same. "
455 *	**Last line:** typing error, "excavation" to be deleted Indicative depths of investigation (below the lowest point of the foundation or excavation base excavation) are given in Table 4.21 and may be used as guidance. "base excavation) are given" has to read: "base) are given"
470	**1st line:** incorrect reference year and a typographic error CERC (1977). *Shore protection manual [SPM], 3rd edn.* Coastal Engineering Research Center, US Army Corps of Engineers, Vicksburg, MS - "CERC (1977)" → "CERC(1984)" - "*3rd edn.*" → "*4th edn.*"

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493	**Equation 5.9 (maximum of wave run-up):** the berm factor, γ_b, to be added $$R_{u\,2\%}/H_{m0} = \gamma_f \gamma_\beta \left(B - C/\sqrt{\xi_{m-1,0}}\right) \qquad (5.9)$$ Please note that this erratum has not yet been corrected in the source documents (TAW, 2002a) and the EuroTop Manual (EA, ENW, KFKI, 2007). The Equation has to read: $$R_{u2\%}/H_{m0} = \gamma_f\ \gamma_\beta \left(B - C/\sqrt{\gamma_b\ \xi_{m-1,0}}\right)$$
501	**Table 5.4, line 8 – last column** typing error for V_{max} Vehicles Unsafe for driving at moderate or high speed, impulsive overtopping giving falling or high velocity jets: $q > 1.10^{-5} - 5.10^{-5}$, $V_{max} > 5{\cdot}10^{-3}$ Unsafe for driving at low speed, overtopping by pulsating flows at low levels only, no falling jets: $q > 0.01 - 0.05$, $V_{max} > 1{\cdot}10^{-3}$ Unsafe for driving at low speed, … : $V_{max} > 0.1$
501	**Last line of page / Table 5.4;** typing error Damage even if promenade paved: $q < 0.2$ "$q < 0.2$" → "$q > 0.2$"
505	**Table 5.6: 1st row – left part:** typographic error (power -2 → power -3) Slope: 1:1; h_B (m): - 4.0; B_B (m): 10; a: $6.40{\cdot}10^{-2}$; b: 19.50 "$6.40{\cdot}10^{-2}$ " → "$6.40{\cdot}10^{-3}$ "
528	**Equation 5.83:** typographic error "<" to read: ">" **subcritical:** for $h_b > 2/3\ H$ or $H - h_b < 0.5 h_b$ (5.82) **supercritical:** for $h_b < 2/3\ H$ or $H - h_b < 0.5 h_b$ (5.83) The Equation 5.83 has to read: **supercritical**: for $h_b < 2/3\ H$ or $H\text{-}h_b > 0.5\ h_b$
529	**Equation 5.87:** typographic error (+ instead of -) $$L_s = B + \left(2d - 0.67(h_1 - h_3)\right)\cot\alpha \qquad (5.87)$$ "$h_1 - h_3$" → $h_1 + h_3$". The correct Equation reads: $$L_s = B + \left(2d - 0.67\left(h_1 + h_3\right)\right)\cot\alpha$$

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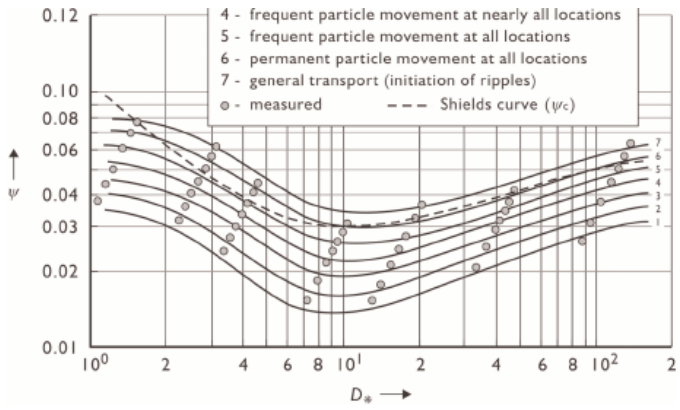
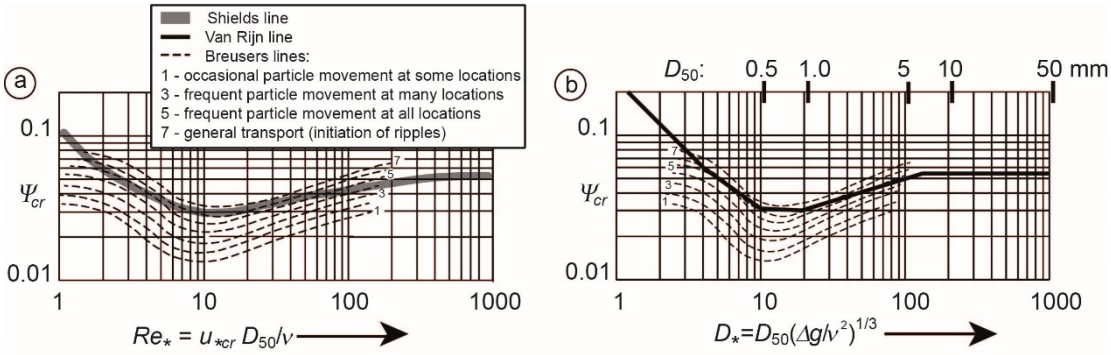
530 *	**5th line from below**: typing error, b_t i.s.o. h_t h_t = gap width (m) between both toes of the dam heads (see Figure 5.24) "h_t = gap width" has to read: "b_t = gap width"
532 *	**Box 5.8, 4th line**: incorrect cross references is related to the relative size of the closure gap (ie width, b (m), and sill height, d (m)), and is furthermore dependent on the values of ($H - h_b$) or H for a vertical closure (see Equations 5.92 and 5.93) and the value of ($h_1 - h_2$) for a horizontal closure (see Equation 5.94). The key difference between the two methods is "(see Equations 5.92 and 5.93)" has to read: "(see Equations 5.90 and 5.91)"
533 *	**4th line from above**: incorrect wording / guidance single relative dam height, $d/h_b = 1$. It can be seen that the value of the discharge coefficient, μ (-), increases with increasing values of both the crest width, B, and slope angle, α "of both the crest width, B, and slope angle, α " has to read: "of the crest width, B, and the inverse of the slope angle, α "
535 *	**Table 5.15, third row**: incorrect indication of flow condition Verdo / high dam (narrow, rough, porous) / Eq 5.85 / 1.0 / 0.9–1.1 / subcritical The flow condition (last column) for high dam has to read: "supercritical", i.s.o. "subcritical"
536 *	**6th line from below:** incorrect wording: 'time' to delete induces submerged weight) and cohesion. Cohesion is only relevant to time sediments in the clay and silt range ($D < 5$ μm and $D < 50$ μm, respectively) or fine sand ($D < 250$ μm) with "relevant to time sediments" has to read: "relevant to sediments"
539	**8th line from below**: incorrect symbol water conditions there may be substantial differences up to $H_s = 1.3\ H_{m0}$ (see Section 4.2.4) "H_s = " → "$H_{1/3}$ = "
543	**12 – 14th lines from below:** unclear guidance **NOTE:** The packing density of concrete armour layers is the same as defined above in Equation 5.99, with D_{n50}. The packing density is then $N = \phi/D_n^2$, where ϕ is the **packing density coefficient** (-), see also Section 3.12. "Equation 5.99, with D_{n50}" → "Equation 5.99, but then with D_n instead of D_{n50}"

Page No	Erratum / Correction
545 *	**Figure 5.32;** the Shields curve / figure is incorrect



The correct figures [(a) with the Reynolds number, based on the shear velocity: Re_*; and (b) with the non-dimensional stone diameter, D_*] are as below:



An additional Note to be added below the Figure:

"3 The ratio D_*/D_{50} as used is based on a kinematic fluid viscosity of $\nu = 1.33\ 10^{-6}$ m^2/s"

The caption text of this Figure to be modified as follows:

The Shields diagram (figure a – left) and the modified Shields diagram (b) for steady flow

546	**Equation 5.104: typing error:** power '2' is missing

Equation 5.104 gives the Shields parameter as a function of the depth-averaged critical velocity, U_{cr} (m/s):

$$\Psi_{cr} = \frac{1}{C^2} \cdot \frac{U_{cr}}{\Delta D} \qquad (5.104)$$

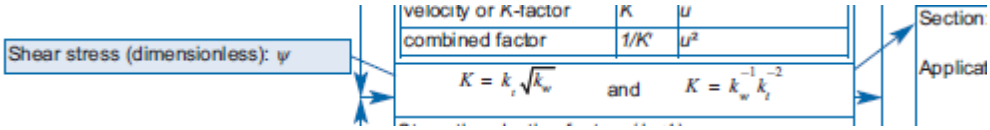
The Equation has to read: $\Psi_{cr} = \frac{1}{C^2} \frac{U_{cr}^2}{\Delta D}$

547 *	**3rd line from above:** incorrect cross reference

formulae, where ψ_{cr} is given as a function of a non-dimensional grain size, D_* (-). Equation 5.115 gives the general form of this approximation:

$$\psi_{cr} = AD_*^B \qquad (5.105)$$

"Equation 5.115" has to read: "Equation 5.105"

Page No	Erratum / Correction
548	**9th line from below**: typographical error Equation 5.117 can be rewritten using $z_0 = k_s/30$ (see Section 4.3.2.4) as Equation 5.111: $$f_w = 0.237\left(\frac{a_o}{k_s}\right)^{-0.52} \quad \text{for } a_o > 0.636\,k_s \qquad (5.111)$$ "Equation 5.117" to read "Equation 5.109"
548 *	**First line below Equation 5.108**: typing error where f_w is the friction factor (-) and u_o is the peak orbital velocity near the bed (m/s²), which may be determined, as a first approximation, by linear wave theory (Equation 4.49). "bed (m/s^2), " has to read: "bed (m/s), "
550 551	**Last line and 6th line from below page 550; and 1st line of page 551:** incorrect cross references prototype. Excessive turbulence levels, eg in excess of r = 10 to 15 per cent, may occur due to particular interactions of flow and structures as listed in Section 4.2.5.8. "Section 4.2.5.8" has to read: "Section 4.3.2.5" [3 times]
552	**7th line below Box 5.10:** incorrect cross-reference to Equation profile, Section 4.3.2.4). This velocity is then substituted into Equations 5.104 and 5.133. **Application of correction factors** "5.133." → "5.123."
555 *	**Figure 5.34; central part:** typing error: K → K'  "$K = k_w^{-1}\, k_t^{-2}$" → $K' = k_w^{-1}\, k_t^{-2}$"
558	**Table 5.21:** incorrect definition for structures with N_s = 3-6 **Table 5.21** *Relationship between static and dynamic stability number* Structure type / $N_s = H_s/(\Delta D_{n50})$ / *HoTo* Statically stable breakwaters / 1–4 / < 100 Dynamic/reshaping breakwaters / 3–6 / 100–200 Dynamic/reshaping breakwaters" to read: "Dynamically stable reshaping structures"

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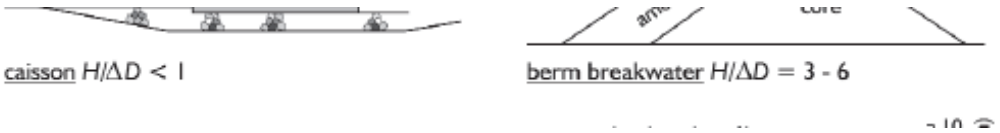
559	**13th and 16th line from above:** Incorrect definitions • $N_s = H/(\Delta D) = 3$ to 6: **Dynamic/reshaping breakwaters** These structures are characterised by steeper slopes above and below the still water level and a gentler slope in between. This gently sloping part reduces the wave forces on the armour units. Reshaping breakwaters are often designed with a very steep seaward slope and a horizontal berm just above the (design) still water level. The first storms develop a more a) "Dynamic/reshaping breakwaters" to read: "Dynamically stable reshaping structures" b) "Reshaping breakwaters are " to read" "Reshaping structures are "
559	**20th line:** incorrect definition • $N_s = H/(\Delta D) = 6$ to 20: **Dynamic rock slopes** The diameter of the armour stones is relatively small and cannot withstand severe wave "Dynamic rock slopes" has to read "Dynamic rock slopes and beaches"
559	**Figure 5.36:** incorrect legend  "berm breakwater $H/(\Delta D) = 3 - 6$" to read: "berm breakwater $H/(\Delta D) \leq 3$"
576	**Box 5.15:** typographic errors (4th, 6th and 8th line from below) and incomplete and incorrect guidance, also in comparison with version of October 2013 Application of the deep-water formula (Equation 5.136), using T_m, will lead in this situation (a 6 h storm, ie $N = 6 \times 3600/9.5 = 2273$) to: $D_{n50} = 1.15$ m and $M_{50} = 4.0$ tonnes. Using the shallow water formula (Equation 5.139), with again $N = 6 \times 3600/9.5 = 2273$, leads to: $H_s/(\Delta D_{n50}) = 1.7$, which results in a armourstone size of: $D_{n50} = 1.4$ m and a median mass of : $M_{50} = 7.2$ tonnes. **Conclusion:** The stability of rock-armoured slopes in very shallow water conditions requires special attention; in this example the minimum mass of the armourstone is 80 per cent larger than expected based on the deep-water formula. Corrections as per former errata list, to be ignored: a) ~~"D_{n50} = 1.15 m and M_{50} = 4.0 tonnes." → "D_{n50} = 1.27 m and M_{50} = 5.4 tonnes.~~" b) "~~is 80 percent larger than" → "is 30 percent larger than~~" The ruling errata and corrections are as follows: a) 8th line from below: "D_{n50} = 1.15 m and M_{50} = 4.0 tonnes." → "D_{n50} = 1.25 m and M_{50} = 5.2 tonnes. Applying the same Equation, but then with $H_{2\%}$ instead of H_s and c_{pl} = 8.7 instead of 6.2 (because of the ratio $H_{2\%}/H_s$ = 1.4 for deep water), as proposed by van der Meer (1988b), will lead to: D_{n50} = 1,11 m and M_{50} = 3.6 tonnes." b) 6th line from below: "= 1.7, … : D_{n50} = 1.4 m and a median mass of: M_{50} = 7.2 tonnes." → "1.97, … : D_{n50} = 1.27 and a mass of M_{50} = 5.4 tonnes."

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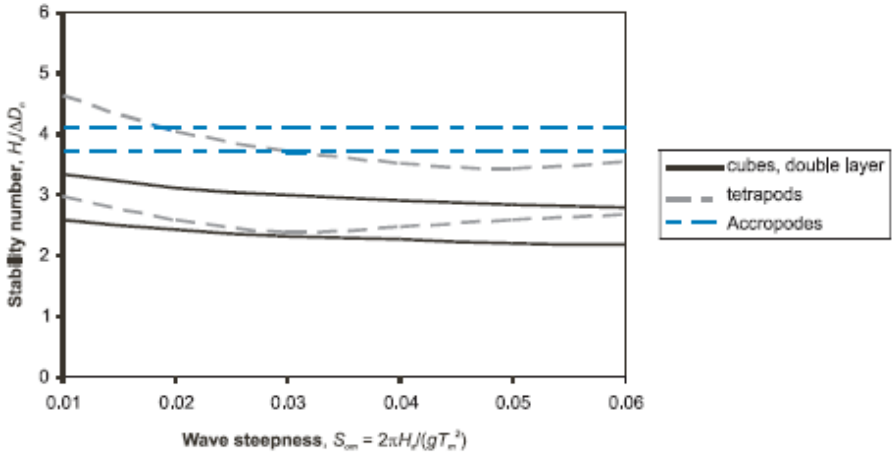
	c) 3rd and 4th line from below: "is 80 percent larger … deep-water formula." → "is hardly larger … deep-water formula (Equation 5.136), using H_s, and 50 percent larger than expected when using the same Equation, but then with $H_{2\%}$ instead of H_s. The latter is therefore not advised as a safe approach; see also page 574."
577 *	**8th line below Table 5.27:** inconsistent notation, *d* defined as a function of the depth (via $H = \gamma d$, where d is the water depth (m) and γ is the wave breaking coefficient with an average value of $\gamma = 0.5$ and a standard deviation of $\sigma_\gamma = 0.15$). "$H = \gamma d$, where *d* is the water depth " has to read: "$H = \gamma h$, where *h* is the water depth "
585	**2nd line above Equation 5.145:** ambiguous guidance y_s = distance to the bank normal to the sailing line (m). This line has to read: y_s = distance between ship's hull and the bank, normal to the sailing line (m).
594	**Figure 5.47**: printing mistake (**only in the hard copy**). The top two horizontal dash lines refer to Accropodes, whereas the two grey middle curved ones refer to tetrapods. **NOTE**: the Figure below (copy from CD and PDF version) is correct!  Figure 5.47 *Stability number versus fictitious wave steepness based on results of model tests for start of damage and failure limits (N = 1000 waves; side slope 1:1.5)*
598 *	**3rd line from above:** incorrect cross reference For the filter function of underlayers, reference is made to Section 5.4.5.3, where geotechnical filter rules are discussed. For coastal structures modified filter rules are used, as discussed above and in Section 5.2.2.10. "Section 5.4.5.3" has to read: "Section 5.4.3.6"

Page No	Erratum / Correction
600	**Equation 5.164:** π not in Italic font $$r_D = \left(1.25 - 4.8\frac{R_c}{H_s}\sqrt{\frac{s_{op}}{2\pi}}\right)^{-1} \qquad (5.164)$$ This Equation has to read: $r_D = \left(1.25 - 4.8\frac{R_c}{H_s}\sqrt{\frac{s_{op}}{2\pi}}\right)^{-1}$
600	**1st line below Equation 5.164:** wrong guidance $r_D = \left(1.25 - 4.8\frac{R_c}{H_s}\sqrt{\frac{s_{op}}{2\pi}}\right)$ (5.164) where R_c is the crest freeboard (m), and s_{op} the wave steepness in deep water (-), based on the peak wave period, T_p (s). "s_{op} the wave steepness in deep water (-), " → "s_{op} the fictitious wave steepness (-), "
613 / 614	**Equations 5.176 and 5.177**: last term in either equation has to be positive $$\frac{Rec}{D_{50}} = -10.4 + 0.51\left(\frac{H_s}{\Delta D_{50}}\right)^{2.5} + 7.52\left(\frac{D_{85}}{D_{15}}\right) - 1.07\left(\frac{D_{85}}{D_{15}}\right)^2 - 6.12R_P \qquad (5.176)$$ $$\frac{Rec}{D_{n50}} = -12.4 + 0.39\left(\frac{H_s}{\Delta D_{n50}}\right)^{2.5} + 8.95\left(\frac{D_{n85}}{D_{n15}}\right) - 1.27\left(\frac{D_{n85}}{D_{n15}}\right)^2 - 7.3R_P \qquad (5.177)$$ These two equations have to read: $$\frac{Rec}{D_{50}} = -10.4 + 0.51\left(\frac{H_s}{\Delta D_{50}}\right)^{2.5} + 7.52\left(\frac{D_{85}}{D_{15}}\right) - 1.07\left(\frac{D_{85}}{D_{15}}\right)^2 + 6.12R_P \qquad (5.176)$$ $$\frac{Rec}{D_{n50}} = -12.4 + 0.39\left(\frac{H_s}{\Delta D_{n50}}\right)^{2.5} + 8.95\left(\frac{D_{n85}}{D_{n15}}\right) - 1.27\left(\frac{D_{n85}}{D_{n15}}\right)^2 + 7.3R_P \qquad (5.177)$$
615 / 616	**A Note to be added at the end of the page / section** **NOTE**: The stability of the rear-side of a berm breakwater is very important for its overall stability. In the case of moderate to severe damage to the rear-side, the risk of total failure of the crest and front side of a berm breakwater is very large. Van der Meer and Veldman (1992) suggested using the following values for the overall design factor (see also PIANC, 2003a): $\frac{R_c}{H_s}s_{op}^{1/3} = 0.25$ for start of damage $\frac{R_c}{H_s}s_{op}^{1/3} = 0.21$ for moderate damage $\frac{R_c}{H_s}s_{op}^{1/3} = 0.17$ for severe damage where R_c is the crest freeboard (m) and s_{op} is the fictitious wave steepness (-) based on the peak wave period, T_p (s).

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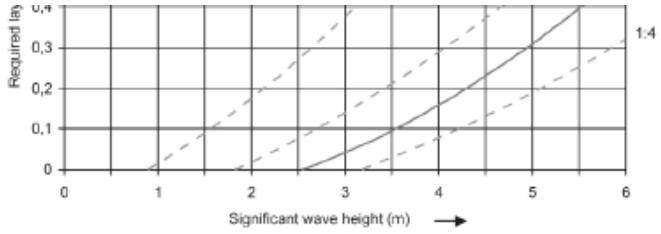
617 *	**6th line below Equation 5.185:** incorrect cross reference diminish the hydraulic gradients at the surface of the underlying subsoil (Section 5.2.2.10 and Section 5.4.5.3). In either case it is important that both the subsoil and the stone filling "Section 5.4.5.3" has to read: "Section 5.4.3.6"
617 *	**7th line from below:** gradings mentioned are from former armourstone standard NEN 5180 stone to the asphalt grout. If a smaller grading of stone is used (50/150 mm or 80/200 mm), for example as a new layer over an existing revetment, asphalt mastic must be used as the To be consistent with the current standard EN 13383: "(50/150 mm or 80/200 mm)" has to read: "(45/125 mm, 63/180 mm or 90/250 mm)"
617 *	**Last line:** designed for water pressure. For more information on this, reference is made to the *Technical report on the use of asphalt in water defences* (TAW, 2002a). "(TAW, 2002a)" has to read: "(TAW, 2002b)"
617 / 618	**Figure 5.68, Guidance regarding minimum layer thickness** 1. The lower part of the Figure is not reliable as the minimum layer thickness cannot be zero for wave heights > 0 m. A Note to be added.  **Figure 5.68** *Layer thickness for fully penetrated rock revetments* "**Note**: The minimum layer thickness is: 1.5 D_{n50} (see page 617)" 2. The same page 617: The minimum layer thickness needed in the wave impact zone is also determined by the stone diameter, D_{n50}. To obtain a well penetrated revetment, the thickness needs to be more then $1.5D_{n50}$. For a fully penetrated rock revetment, the stone grading 5–40 kg is usually "then" → "than"
618 *	**Line above section 5.2.2.8:** incorrect cross reference revetments can be found in TAW, 2002a. ***5.2.2.8 Stepped and composite slopes*** "TAW, 2002a. " has to read: "TAW, 2002b. "

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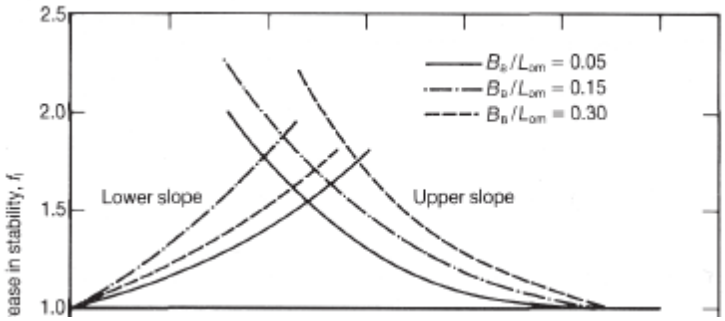
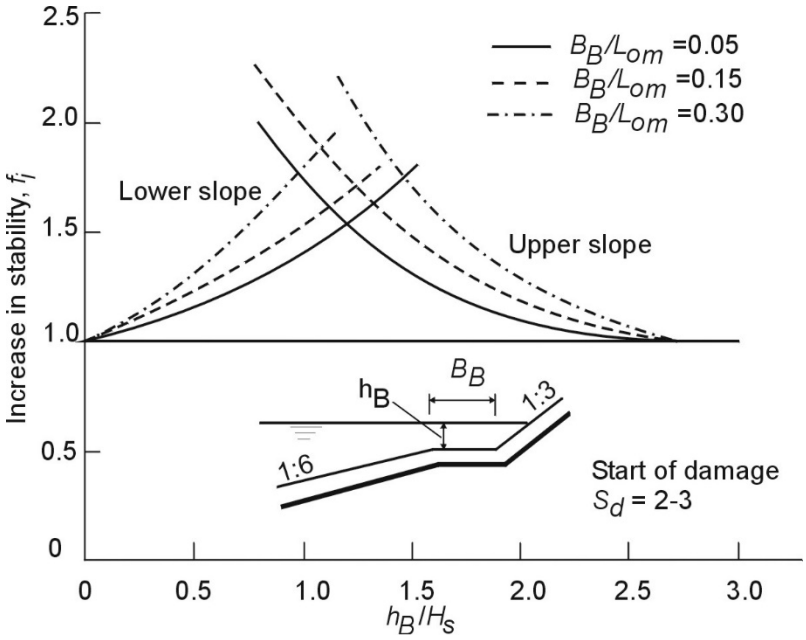
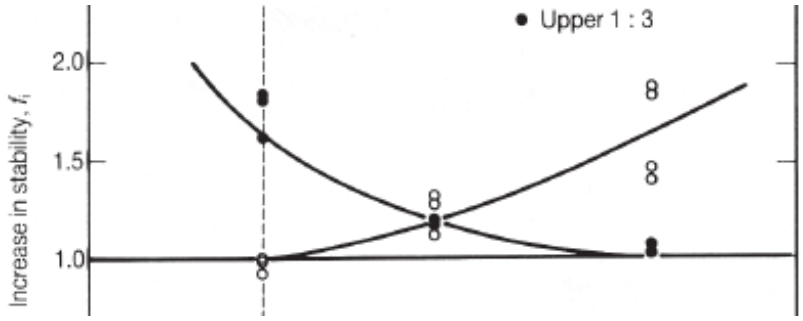
619	**Figure 5.69:** incorrect line indication for lower slope factor  The correct Figure 5.69 is as below: 
619	**Figure 5.70:** incorrect plots and lines  The correct, revised Figure 5.70 is as below:

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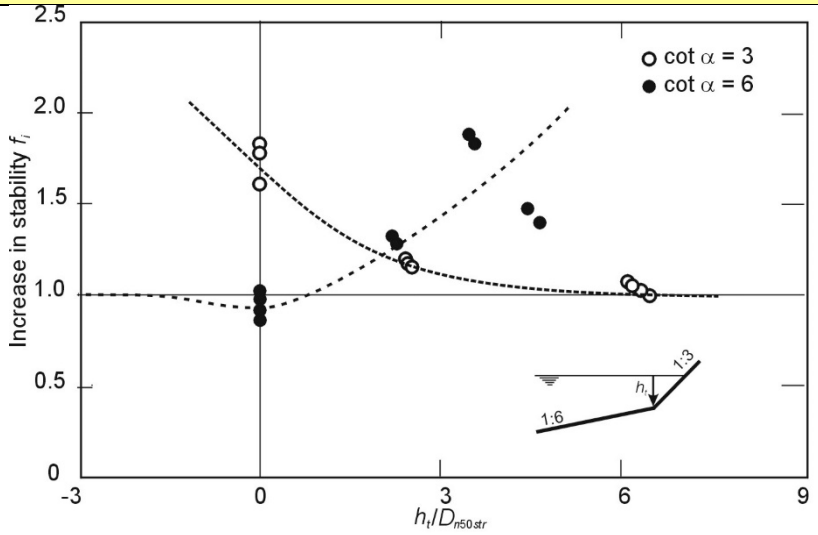
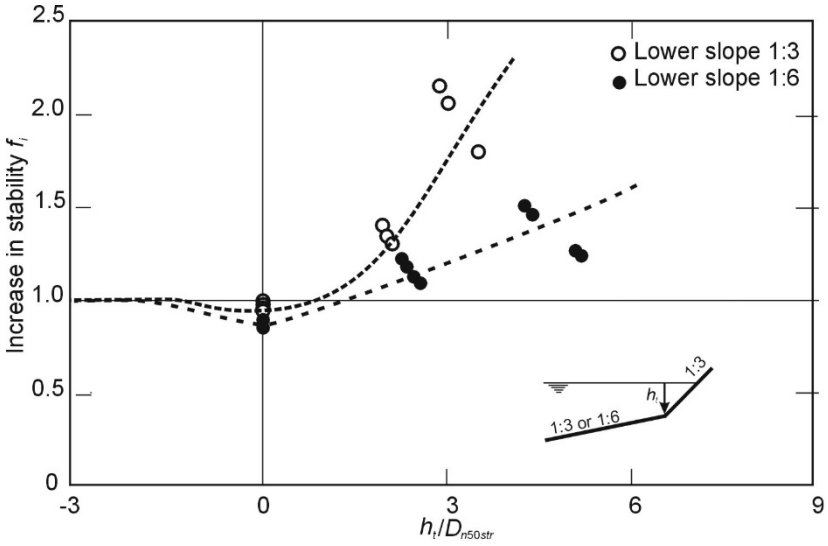
	 **Figure 5.70** ***Stability increase factors, f_i, for composite armourstone slopes***
620	**Figure 5.71:** incorrect data plots and lines The upper and the lower figure have been combined in the revised Figure 5.71 below:  **Figure 5.71** ***Stability increase factors, f_i, for armourstone slopes if the upper slope is smooth***
623	**3rd line from above:** incomplete guidance 5.188 respectively. $\frac{H_s}{} = \left(1.6 + 0.24\left(\frac{h_t}{}\right)\right) N_{-}^{0.15}$ (5.187) "5.188 respectively." has to read: "5.188 respectively (see also Pilarczyk, 1998)."

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623 *	**2nd line below Figure 5.74**: typing error, 0.4 i.s.o. 0.7 **NOTE:** The reader should realise that Equation 5.187 is only based on tests with a h_i/h ratio of 0.7–0.9. **Equation 5.187 should not be extrapolated**. When the water depth becomes more "of 0.7-0.9." has to read: "of 0.4-0.9."
626	**Box 5.22, 7th, 9th and 11th line:** typographic errors • applying Equation 5.189 for the Tanimoto/Takahashi method, these hydraulic and structural data give: $a = (1 - \kappa)/\kappa^{1/3} = (1-(0.6/0.64)\ \kappa_2)/(0.6/0.64)^{1/3} = (1 - 0.14)/0.14^{1/3} = 1.65$; and hence, the stability number, $N_s = \max\{1.8, 1.3 \times 1.65 \times 1.5 + 1.8 \exp(-1.5 \times 1.65\ (1 - 0.14)\ 1.5\} = \max\{1.8, 3.2\}$, hence: $N_s = 3.2$. The stone size required, is $D_{n50} \cong 0.6$ m • applying Equation 5.190 for the Madrigal/Valdés method, these hydraulic and structural data give: $N_s = (5.8 \times 0.6 - 0.6)\ N_{od}^{\ 0.19} = 2.6$. The stone size required is at least: $D_{n50} \cong 0.7$ m. **7th line**: (κ_2 and parentheses to be added); it has to read: "give: $a = (1\text{-}\kappa)/\kappa^{1/3} = (1\text{-}(0.6/0.64)\ \kappa_2)/((0.6/0.64)\ \kappa_2)^{1/3}$ = etc" **9th line**: "$D_{n50} \cong 0.6$ m" → "$D_{n50} \cong 0.4$ m" **11th line**: "$D_{n50} \cong 0.7$ m" → "$D_{n50} \cong 0.5$ m"
630	**1st line below Equation 5.192:** incorrect cross reference $\frac{M_{50u}}{M_{50a}} = \frac{1}{15}$ to $\frac{1}{10}$ (5.192) This criterion is stricter than the geotechnical filter rules given in Section 5.4.5.3 and gives "Section 5.4.5.3" has to read: "Section 5.4.3.6"
630	**Last line of Section 5.2.2.10:** incorrect cross reference and unclear guidance Underlayers and filter layers should be designed to prevent the transport of fine material, but allow for the transport of water. A full discussion on filter criteria is given in Section 5.4.5.3, where the various filter criteria for stability are presented. "Section 5.4.5.3 … presented." has to read: "Section 5.4.3.6, where various filter criteria for stability under permanent flow conditions are presented."
631	**Equation 5.194:** A factor 0.008 to be added and the power -1/6 has to read 1/6 $D_{n50} = \left(\frac{S_d}{\sqrt{N}}\right)^{-1/6} \left(\frac{u_{1\%} T_{m-1,0}}{\sqrt{\Delta}}\right) (\cot\alpha_{rear})^{-2.5/6} \left(1 + 10\exp\left(\frac{-R_{c,rear}}{H_s}\right)\right)^{-1/6}$ (5.194) Equation 5.194 has to read: $D_{n50} = 0.008 \left(\frac{S_d}{\sqrt{N}}\right)^{-1/6} \left(\frac{u_{1\%} T_{m-1,0}}{\sqrt{\Delta}}\right) (\cot\alpha_{rear})^{-2.5/6} \left(1 + 10\exp\left(-R_{c,rear}/H_s\right)\right)^{1/6}$

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632	**Figure 5.79 caption:** explanatory note to be added  **Figure 5.79** *Damage at rear side as function of the maximum velocity at the rear side of the crest, $u_{1\%}$* Second line of the caption has to read as follows: "*of the crest, $u_{1\%}$; the trend line is valid for Δ = 1.65.*"
633	**Table 5.48:** typographic error **Table 5.48** *Ranges of validity of parameters in Equation 5.194* Parameter: Fictitious wave steepness at toe: $s_{m-1,0} = 2\pi H_s/(gT_{m-1,0}^2)$ — Range: 0.019–0.036 "$s_{m-1,0}$ = " → "$s_{s-1,0}$ = "
633	**Table 5.48:** typographic error Damage level parameter, S_d — 2–3.0 The damage level ranges from 2 to 30. "2-3.0" has to read: "2-30".
639	**Table 5.50:** incomplete guidance (R_c is unclear, and one range is incorrect) Relative run-up level — R_c/R_{ca} — 1–2.6 Relative berm width — R_{ca}/B_a — 0.3–1 - The range of the relative berm width has to read "0.3–1.1" instead of "0.3–1". - An explanatory note to be added below the Table: "**Note**: R_c is the elevation of the crown wall above SWL, = R_{ca} + d_{ca}, see Figure 5.83."
639 *	**1st and 2nd line above Figure 5.84:** incorrect notation for wave height For preliminary design with this method, it is recommended to use for the wave height (at the structure toe) $H = H_{99.8\%}$. If no information on the wave height distribution is available, $H_{99.8\%} = 1.8H_s$ can be used as an estimate, (see Section 4.2.4.4). "$H_{99.8\%}$ " has to read: "$H_{0.2\%}$ " [twice]
640	**Equation 5.214 vs Figure 5.86**: Incorrect guidance:, B_u is negative $$R_u/H = A_u\left(1-\exp\left(B_u\xi\right)\right) \qquad (5.214)$$ As B_u in Figure 5.86 is positive, the exponent has to be negative. Equation 5.214 has to read: $R_u/H = A_u\left(1-\exp\left(-B_u\xi\right)\right)$

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641	**Table 5.51:** typographic error **Table 5.51** *Empirical coefficients for calculating pulsating pressures* B_u / D_{n50} | a | b 1 | 0.446 | 0.068 - "B_u" has to read: "B_a", the berm width in front of the crown wall. - The note below the Table to be deleted, as this is not applicable.
650 *	**Table 5.53:** ambiguous guidance for turbulence factors for special cases **Turbulence factor, k_t** • normal turbulence level: $k_t^2 = 1.0$ • non-uniform flow, increased turbulence in outer bends: $k_t^2 = 1.5$ • non-uniform flow, sharp outer bends: $k_t^2 = 2.0$ • non-uniform flow, special cases: $k_t^2 > 2$ (see Equation 5.226) The text of the 4th bullet has to read: • heavy turbulence; in hydraulic jumps: $k_t^2 = 3$ (see Pilarczyk (1995)) Additional 5th bullet: • extreme turbulence due to screw jets: $k_t^2 > 3$ (see Pilarczyk (1998)) And a Note to be added: "**NOTE**: For evaluation of the stability due to ship-induced propeller jet velocities, the use of Equation 5.226 is advised, as the Pilarczyk formula has not been validated for these loads. "
650	**Table 5.53;** typographic errors: "D_n" is ambiguous guidance where h = water depth (m) and k_s = roughness height (m); k_s = 1 to 3D_n for rip-rap and armourstone; for shallow rough flow (h/D_n < 5), $k_h \cong 1$ can be applied • not fully developed velocity profile: $k_h = \left(1 + h/D_n\right)^{-0.2}$ (5.222) - 4th line above Eq. 5.222: "D_n" to read: "D_{n50}" (it refers to armourstone) - 3rd line above Eq. 5.222: "D_n" to read: "D" (it refers to either gabions or armourstone) - Equation 5.222 has to read: $k_h = \left(1 + h/D\right)^{-0.2}$
652	**Caption to Table 5.56:** typing error **Table 5.56** *Design guidance for parameters in Maynord formula (Equation 5.234)* "(Equation 5.234)" → "(Equation 5.224)"

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654 *	**Equation 5.226 and various definitions in text below the equation:** unclear and ambiguous guidance; the turbulence factor is defined different from that in Pilarczyk's formula, and twice the factor '2' gives rise to confusion Equation 5.226: $$\frac{U'^2/2g}{\Delta D_{50}} = 2\frac{k_{sl}}{k_t^2} \qquad (5.226)$$ where D_{50} is the median sieve size of the armourstones (m), k_{sl} is the slope factor (-) and k_t is the turbulence factor (-), both factors defined in Section 5.2.1.3. The depth-averaged velocity, U', can be substituted by U_r for return currents and by u_p for propeller jets. Return currents can be calculated with the formulae presented in Section 4.3.4.1. In Equation 5.226, the value k_t^2 = 1.4 to 1.6 can be used for the corresponding turbulence factor, in the case of return currents. **Propeller jet velocities** can be calculated with Equations 4.187 to 4.190 in Section 4.3.4.3. For standard situations in which vessels are not fully loaded and in which the berthing position is not always the same, the value k_t^2 = 5.2 can be used in Equation 5.226. For situations in which the maximum impact of the propeller jet occurs frequently and always at the same place a higher value, k_t^2 = 6, is recommended. The Equation 5.226 and the two lines below the Equation have to read as follows: " $$D_{50} = \beta_{Iz} \frac{U'^2}{2\, g\, k_{sl}\, \Delta}$$ where D_{50} is the characteristic sieve size of the armourstone required (m), k_{sl} is the slope factor (-) as defined in Section 5.2.1.3, and β_{Iz} is the dedicated turbulence / stability factor (-) for this 'Izbash' based Equation. " The wording in the fifth line below the Equation: "the value k_t^2 = 1.4 to 1.6 can " has to read: "the value β_{Iz} = 1.4 has to " The wording in the 8th line below the Equation: "the value k_t^2 = 5.2 can be " has to read: "the value β_{Iz} = 2.6 has to " The wording in the 10th line below the Equation: "higher value, k_t^2 = 6, is recommended" has to read: "higher value, β_{Iz} = 3, is recommended."
656	**Equation 5.228**: D_{n50} to read D_{50} Equation 5.228 gives the relationship between the required stone size, D_{n50} (m), and the relevant hydraulic and structural parameters: $$D_{n50} = 0.7\frac{(r_0 U)^2}{g\Delta\psi_{cr}} \qquad (5.228)$$ 1. "stone size, D_{n50} (m)" → "stone sieve size, D_{50} (m)" 2. The equation has to read: $D_{50} = 0.7\frac{(r_0 U)^2}{g\Delta\psi_{cr}}$

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658	**9th line from below:** typing error: "*b*" in *hb* is index: h_b for discharge *q*, but hydraulic height (*H*- or $H - hb$) parameters are only an overall "(*H*- or $H - hb$) parameters" → "(*H*- or $H - h_b$) parameters"
661 *	**1st and 2nd line from below**: typographic errors relationships determine the curve of $H/(\Delta D_{n50})$ versus $h_b/(\Delta D_{n50})$. Instead, one should apply $(h\text{-}h_b)/(\Delta D_{n50})$, which appears to be more or less a constant for varying values of $H_b/(\Delta D_{n50})$ (Figure 5.99). - "$(h\text{-}h_b)/(\Delta D_{n50})$ " has to read: "$(H\text{-}h_b)/(\Delta D_{n50})$ " - "$H_b/(\Delta D_{n50})$ " has to read: "$h_b/(\Delta D_{n50})$ "
705	**5th line from below (line above Equation 5.250):** typing error $\sum E_{j;d}$: $$\sum_i E_{i;d} \le \sum_j R_{j;d} \qquad (5.250)$$ $\sum E_{j;d}$ has to read: $\sum R_{j;d}$
718	**Caption of Table 5.64:** incorrect symbol for structure slope **Table 5.64** *Residual displacement, Δx, for a range of example structure slopes (σ′ = 35°, p* = 50%) after an earthquake characterised by: a_h/g = 0.25, T = 0.5 s, N_e = 15* "σ' = 35° " → "φ' = 35° "
720	**2nd line above Equation 5.265:** ambiguous guidance **Internal erosion of granular material** A good **geometrically tight** (or **closed**) criterion (Equation 5.265) has been formulated by Kenney and Lau (1985): $$[F_{4D}/F_D - 1]_{min} > 1.3 \qquad (5.265)$$ "A good **geometrically tight** (or **closed**) criterion (Equation 5.265) has been formulated by Kenney and Lau (1985) " has to read: "For **geometrically tight** (or **closed**) granular filters (see below), a good criterion for internal stability is given in Equation 5.265, as formulated by Keeney and Lau (1985) "
720 / 721	**Location of Figure 5.133:** ambiguous guidance Figure 5.133 to be moved from top of page 721 to 17th line from top of page 720, indicated below:

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	the grain size distribution curve. On the basis of Equation 5.265, more practical design rules (Equations 5.266 through 5.269) have been derived
720	**Line above Equation 5.270:** typographic error (*Cv* → C_U) limits the grading width coefficient of **uniformity** of the filter material, *Cv* (-): "*Cv* (-): "→ "C_U (-): "
721 *	**Line above Equation 5.272**: : incorrect guidance (in ~~red~~), also in correction issued earlier, a typing error in former corrigendum of Feb 2016; and Notes to be added for better guidance, including a design diagram **materials are rather uniformly graded** (ie $D_{60}/D_{10} < 10$): $$D_{15f}/D_{85b} < 5 \qquad (5.272)$$ Incorrect former guidance / correction: "**materials are rather uniformly graded** (ie ~~$D_{60}/D_{10} < 10$~~):" has to read: "**materials are well-graded (ie without gaps)** ~~and comply with the internal stability criterion, $D_{60}/D_{10} < 10$~~:" As the criterion has been derived for uniform materials (ie $C_U < 3$) and rather thick filter layers, the text of the line above Equation 5.272 has to read: "**materials are well graded (ie without gaps) and rather uniform** (ie $D_{60}/D_{10} < 3$):" In addition to this, notes to be added between the Note above Figure 5.134 and that Figure 5.134: "**NOTE:** The criterion given above in Equation 5.272 (ratio < 5, based on the characteristic pore size of $0.2D_{15f}$), has been derived for flow conditions and for rather thick filter layers, ie $t = 5D_{50f}$. In the case of smaller layer thicknesses, that factor should be smaller, up to ~~0.33~~ 3.3 for $t = 2D_{50f}$. Alternatively, model tests could yield the appropriate value. **NOTE:** Design recommendations for the interface stability of (sloped) granular structures **subject to waves** are neither widely known, nor broadly applied, except for the rather strict ratios given in Section 5.2.2.10 for underlayers: Equations 5.192 and 5.193. The following set of criteria, as suggested by Thompson & Shuttler (1975), are given here as guidance to assess the (in)stability of the interface between top layer (indicated with "*f*") and underlayer ("*b*"): • $D_{15f} / D_{85b} \leq 4$ • $D_{50f} / D_{50b} \leq 7$ • $D_{15f} / D_{15b} \leq 7$ **NOTE:** One single, generally applicable criterion for the interface stability of granular structures subject to flow conditions cannot be presented in the form of one formula, as such criterion depends on the grading widths of both the base material and the filter material. In the case of wide graded base material, the criterion given in Equation 5.272 is unsafe, as too many fines are washed out through the filter material. On the other hand, in the case of wide graded filter material (with $C_U > 6$) on uniform base material, the criterion of Equation 5.272 can be relaxed from 5 to 10. It is, therefore, advised to make use of the design diagram of Cistin/Ziems, presented in Heibaum (2004). The allowable ratio D_{50f}/D_{50b} as presented in that diagram (see Figure

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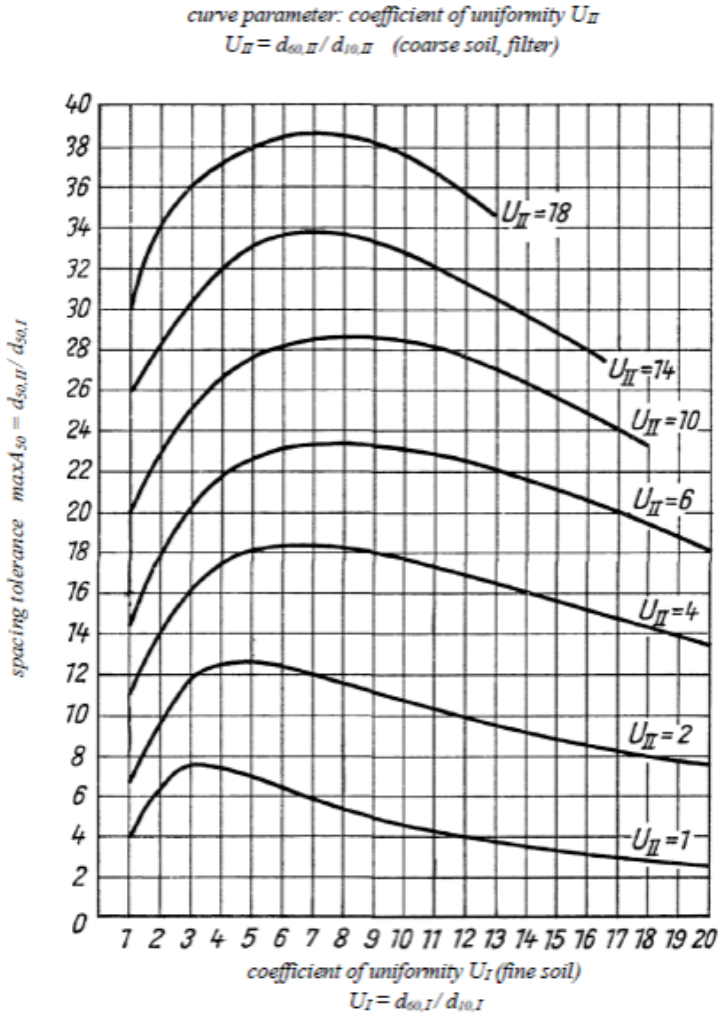
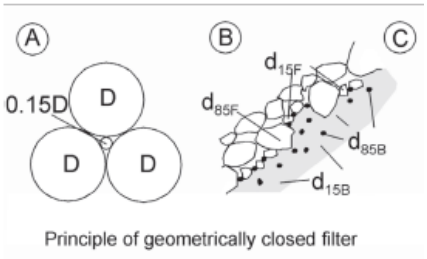
	5.134a), includes a safety factor η = 1.5 and covers a wide range of grading widths for both base and filter material.  **Figure 5.134a**: *Filter design chart according to the Cistin/Ziems approach (Heibaum, 2004)* "
721	**Figure 5.134:** ambiguous guidance in part A  The measure of the pores between the particles ("0.15D") has to read: "0.2D". This is then consistent with the guidance on page 719 ("approximately $0.2D_{15}$") and with the criterion given in Equation 5.272.

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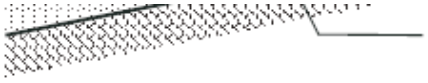
724	**Line above Equation 5.280:** typographic error Equation 5.280), depending on the density of the soil (see Equation 5.309 for definition of density index, D_I) $$D_I = \begin{cases} 18 C_U^{-1.7} D_{85b} & \text{for dense soils } (I_D > 50\%) \\ 9 C_U^{-1.7} D_{85b} & \text{for loose soils } (I_D < 50\%) \end{cases} \quad (5.280)$$ "of density index, D_I)" → "of density index, I_D)"
726 *	**1st line below Equation 5.286**: incomplete definition $$i \le \gamma'/\gamma_w \quad \text{or} \quad i \le (\gamma - \gamma_w)/\gamma_w \quad (5.286)$$ where γ is the the unit weight of the soil (= grains + water) (kN/m³). "the unit weight " has to read: "saturated unit weight"
730	**7th line from below:** typographic error dissolved and transformed into soils. The properties of the soils and rocks may vary within wide limits (up to a factor of 1010) and it is very important to correctly identify those of the "a factor of 1010)" → "a factor of $10 \cdot 10^9$)"
742	**Equation 5.295 and same equation in Figure 5.148:** typographic error $$\lambda = \sqrt{t_f t_c k_c / k_f} \quad (5.295)$$ Permeable filter layer (k_f)  $i_p = \frac{\Delta H}{2\lambda}$ with $\lambda = \sqrt{\frac{t_c t_f k_c}{k_f}}$ **Figure 5.148** *Pressure head distribution in filter layer underneath a semi-permeable cover layer; i_p =* The equation has to read: $\lambda = \sqrt{t_c t_f k_f / k_c}$
745 *	**Box 5.38:** typographic errors (4) 2nd and 3rd line of Example 2: Substituting this in Equations 5.296 and 5.297, it is found that T_{ph} = 105 s and L_{ph} = 6 m. Consequently: $$\frac{T_{ph}}{T} = \left(\frac{B}{L_{ph}}\right)^2 = 25 >> 1$$ - T_{ph} = 105 s and L_{ph} = 6 m" → "T_{ph} = 113 000 s and L_{ph} = 19 m" - "25 >> 1" → "2.5 > 1" 1st and 2nd line from below: that the phreatic level inside the dike only varies noticeably in the outer few metres and that the tidal variation will hardly induce any water level variation in the waterway at its rear side. "the tidal variation " has to read: "the effect of the wind waves "

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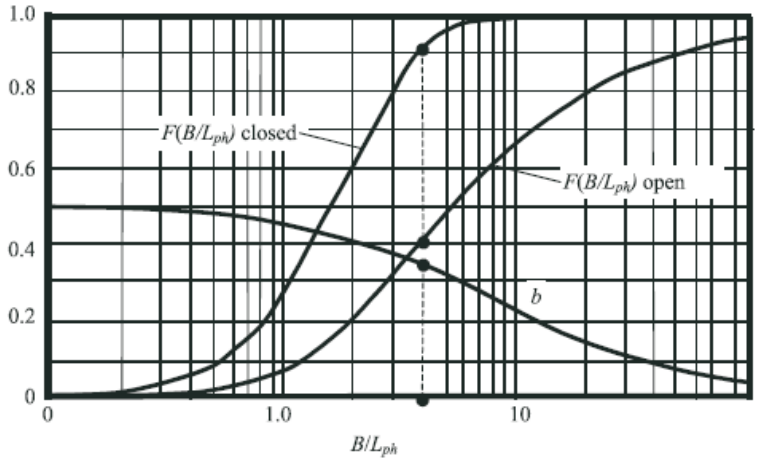
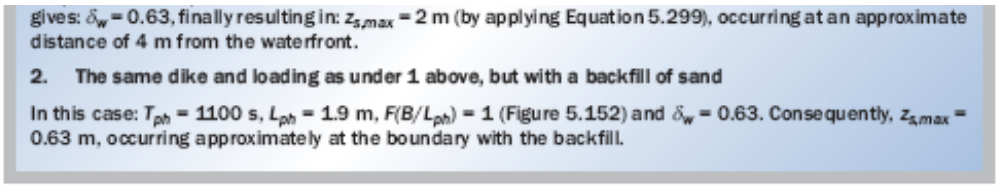
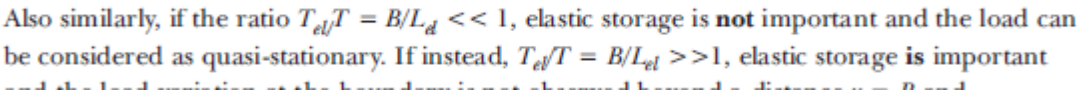
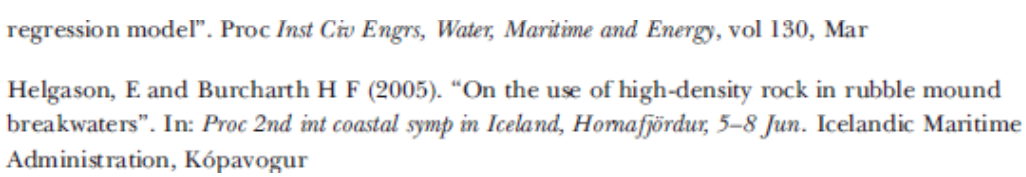
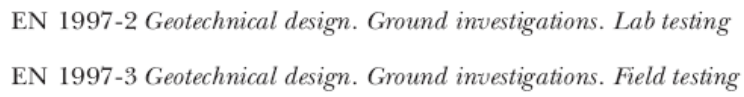
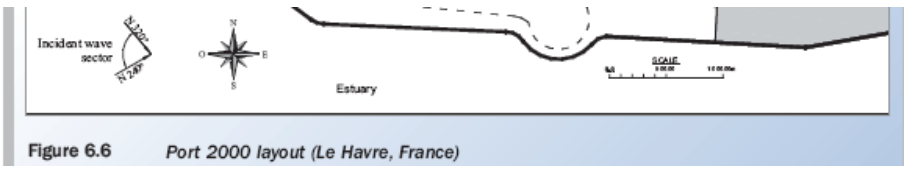
746	**Equation 5.299:** the term '-1' is not part of the square root gradients. Examples are given in Box 5.39. Equations 5.299 and 5.300 may be used to find the maximum internal set-up, $z_{s,max}$ (m), as given in ICE (1988): $\frac{z_{s,max}}{h} = \sqrt{(1+\delta_w F(B/L_{ph}))-1}$ (5.299) The equation has to read: $\frac{z_{s,max}}{h} = \sqrt{1+\delta_w F(B/L_{ph})}-1$
746 *	**2nd line below Equation 5.300**: additional notation (*B*) $\delta_w = 0.1\frac{cH_s^2}{n_v L_{ph} h \tan\alpha}$ (5.300) where: h = water depth (m) δ = wave height parameter (-) To be inserted above "h = water depth (m): " B = structure width at SWL (m) "
746	**Figure 5-152:** printing mistake **(only in the hard copy):**. Label to lower curve should read "*b*" instead of black box. The Figure below (copy from CD and PDF version) is correct.  **Note** For open lee side situations maximum set-up is localised at $b{\cdot}B$ (m) from lee side, where the value of b (-) can be seen in this figure. **Figure 5.152** *Diagram for internal set-up due to slope*
746 *	**Note to Figure 5.152:** typographic error **Note** For open lee side situations maximum set-up is localised at $b{\cdot}B$ (m) from lee side, where the value of b (-) can be seen in this figure. "at $b{\cdot}B$ (m) from lee side, " has to read: "at $b{\cdot}B$ (m) from the sea side at SWL, "

Page No	Erratum / Correction
747	**Box 5-39:** two typing errors  gives: $\delta_w = 0.63$, finally resulting in: $z_{s,max} = 2$ m (by applying Equation 5.299), occurring at an approximate distance of 4 m from the waterfront. **2. The same dike and loading as under 1 above, but with a backfill of sand** In this case: $T_{ph} = 1100$ s, $L_{ph} = 1.9$ m, $F(B/L_{ph}) = 1$ (Figure 5.152) and $\delta_w = 0.63$. Consequently, $z_{s,max} = 0.63$ m, occurring approximately at the boundary with the backfill. 1. "distance of 4 m from the waterfront." → "distance of 6 m from the waterfront." 2. "$z_{s,max} = 0.63$ m, " → "$z_{s,max} = 2.7$ m,"
748 *	**1st and 2nd line below Equation 5.304:** typographic error (twice)  Also similarly, if the ratio $T_{el}/T = B/L_{el} << 1$, elastic storage is **not** important and the load can be considered as quasi-stationary. If instead, $T_{el}/T = B/L_{el} >> 1$, elastic storage **is** important "$T_{el}/T = B/L_{el}$" has to read: "$T_{el}/T = (B/L_{el})^2$ "
762	**20th line from below:** an additional reference to be added  regression model". Proc *Inst Civ Engrs, Water, Maritime and Energy*, vol 130, Mar Helgason, E and Burcharth H F (2005). "On the use of high-density rock in rubble mound breakwaters". In: *Proc 2nd int coastal symp in Iceland, Hornafjördur, 5–8 Jun*. Icelandic Maritime Administration, Kópavogur Just above "Helgason.. …." to be inserted: "Heibaum, M H (2004). "Geotechnical filters – The important link in scour protection". In: *Proc 2nd Int. Conf on Scour and Erosion (ICSE-2), Singapore, 4-7 Nov*. BAW, Karlsruhe "
772	**4th and 5th line below "European standards":** typing error / incorrect reference  EN 1997-2 *Geotechnical design. Ground investigations. Lab testing* EN 1997-3 *Geotechnical design. Ground investigations. Field testing* 1. The part 3 doesn't exist. This 5th line to be deleted. 2. The 4th line to read: "EN 1997-2: 2007. Eurocode 7. *Geotechnical design – part 2. Ground investigation and testing*"
784	**Figure 6.6:** typographic error  Figure 6.6 *Port 2000 layout (Le Havre, France)* "O" as indication to the direction rose to read "W"

Page No	Erratum / Correction
790	**2nd line from below:** typing error Use of concrete armour units (see Sections 3.12 and 6.14) and berm breakwaters (see Section "and 6.14)" → "and 6.1.4)"
836	**3rd line from below:** wrong wording The concept generation, selection and detailing of a rubble mound breakwater can be summarised by the flow chart in Figure 6.41. The numbers refer to the relevant parts of this section. "detailing of a rubble mound breakwater" has to read: "detailing of shoreline protection and beach control structures "
852 *	**First line of section 6.3.3.2:** a verb is missing ***6.3.3.2 Physical boundary conditions*** Sections 4.2 and 4.4 the definition of hydraulic and geotechnical physical boundary "Sections 4.2 and 4.4 the" has to read: "Sections 4.2 and 4.4 give"
860	**7th line from below:** typographic error The toe details shown in Figures 6.57–6.64 indicate that a geotextile may be necessary where construction is to take place on a granular material, to prevent loss of bed material through the structure. The designer should check whether a geotextile is required to ensure interface "6.57" → "6.59"
884	**Last bullet:** wrong word • decreasing viscosity of the transported substances, caused by, among other factors, a temperature drop along a pipeline. "decreasing" → "increasing"
892 *	**4th line above subsection 6.4.4.2:** unclear guidance dependent on shear strength and the penetration depth for dumped armourstone appears to scale linearly with the ratio of the penetrator's mass to its cross-sectional area. "for dumped armourstone" has to read "for (intact) rock"
930	**2nd line below Figure 7.7:** typographic error (*M* i.s.o. M_{50}) The stability of clay-filled bags in tidal currents can be checked. Since ρ = 1500 kg/m³ and M = 50 kg, the nominal diameter of the layer of bags is: $D_n = (M_{50}/\rho)^{1/3}$ (see Section 3.4.2) = "$D_n = (M_{50}/\rho)^{1/3}$ " has to read: "$D_n = (M/\rho)^{1/3}$ "
995	**22nd line:** incorrect reference *scour at bridges and other hydraulic structures* (CIRIA, 2002) or *Scour manual* (Hoffmans and Verheij, 1997). "(CIRIA, 2002)" → "(May et al, 2002)"

Page No	Erratum / Correction
998	**Table 8.2:** typing errors in 6th column ('Period') Table 8.2 *Typical values of hydraulic loads* Situation / Return (U_p) or natural current: Velocity (m/s) / Water level depression: Height Δh (m), Period T (s) / Secondary waves: Height H_s (m), Period T (s) / Wind waves: Height H (m), Period T (s) Small river and restricted navigable channel: 1.0–2.0 * / 0.5–0.75 / 20–60 / 0.5 / 2.5 / 0.5 / 2 Large navigable channel: 2.0 / 1.0 / 20–60 / 1.0 / 2.5 / 1.0 / 3–4 Large river and estuary: 3.0–4.0 / 1.0 / 20–60 / 1.0 / 2.5 / 1.5–2.0 / 5–6 "2.5" should read: "2-5" (three times)
999	**3rd line from above:** typing error: "or" to be deleted **Ice loads** The resistance of river training works against the forces exerted by ice is of particular importance, eg along the shores of lakes and large rivers or in arctic areas. The specific "rivers or in arctic areas" → "rivers in arctic areas."
1003	**3rd bullet in paragraph on 'Crest level':** typing error • a margin to take into account the **effects of seiches** (see Section 4.2) and gusty bumps (single waves) resulting from a sudden violent wind rush), which may vary from a few tens of centimetres to a few metres (for seiches) "and gusty bumps" → "and gust bumps"
1003	**2nd line below 5th bullet:** typing error The combination of the above factors in a probabilistic approach defines the crest level; the freeboard, R_c (m), relative to the desigh water level depends on the last four of the five listed factors above. "the desigh" → "the design"
1005	**Last line:** incorrect reference found in Hoffmans and Verheij (1997), CIRIA (2002) and Sumer and Fredsoe (2002). "CIRIA (2002)" → "May et al (2002)"
1006	**Figure 8.26:** typing error 5.00 m | Fascine mat or standard filter mat or geotextile) Wooden pile length: 1.60 m, diameter: 100 m 2.00 m | "diameter 100 m" → "diameter 100 mm"

Page No	Erratum / Correction
1006	**7th line from below:** incorrect reference When there is a risk of appreciable scour or if it is expected in front of the structure, suitable measures should be taken. The designer should start by assessing the future scour depth (Hoffmans and Verheij, 1997 and CIRIA, 2002). Depending on the outcome and the local "CIRIA, 2002)" → "May et al, 2002)"
1008 *	**Last line of Box 8.1**: incorrect wording • if it did and the apron did not function, no serious consequences were to be expected. This last line has to read: " • If the apron would fail, the consequences would not be serious."
1008 *	**Third line from below**: incorrect wording When it is necessary to replenish a falling apron, the extra volume of armourstone should be dumped on the horizontal part of the apron. The settling mechanism can then distribute the stones over the slope. "the extra volume of " has to read: "an extra volume of"
1009	**Box 8.2:** typing errors and incomplete, ambiguous guidance **1) 11th line from below:** typing error When designing a falling apron, the following aspects should be considered. As the apron will finally be formed in the model, it will be of a single armourstone layer on a steep slope 1:2. It should first of all be checked whether the armourstone size (D_{n50} = 0.20 m in the prototype) is large enough on this steep "D_{n50} = 0.20 m" has to read: "D_{n50} = 0.25 m". **2) 9th line from below:** text is missing; and corrections (in red) of a former version slope. A verification of the slope stability (see Box 8.3) is done, not using the revetment angle but the apron slope angle, α = 26.5° (1:2 slope). Considering this angle value, ϕ = 40° for the repose angle, and equations from Section 5.2.1.3, the appropriate strength reduction factor may be found, k_{sl} = 0.626, which then results in the appropriate armourstone size D_{n50} = 0.179 m. The corresponding M_{50} = 15 kg (D_{n50} = 0.22 m) so a grading of 5-40 kg will suffice. A wide grading is intentionally selected to limit loss "Considering this angle value, …… *until*.. 5-40 kg will suffice. A wide grading is intentionally selected " has to read: "Considering this apron angle and a value of ϕ = 40° for the angle of repose, the relevant slope reduction factor can be assessed using Equation 5.116 (Section 5.2.1.3): k_{sl} = 0.7. The appropriate size of the armourstone required for stability against current velocities up to U = 3 m/s can be evaluated using the Pilarczyk formula, Equation 5.219 (Section 5.2.3). Values used for the various factors and parameters are: mobility parameter, ψ_{cr} = 0.035; relative submerged density of the stones, Δ = 1.65; stability factor, Φ_{sc} = 0.75; velocity profile factor (for h = 20 m), k_h = 0.3; and turbulence factor, k_t^2 = 2 (ie increased turbulence in outer bend). The armourstone size required is: D_{n50} = 0.18 m, with a corresponding mass of M_{50} = 15 kg. An armourstone grading of 5-40 kg ($D_{n50\text{-}av}$ = 0.20 m) would suffice. A wide grading (1-100 kg) has, however, intentionally been selected "

Page No	Erratum / Correction
	3) The last four lines: the wording contains incorrect guidance An expected scour of 6 m implies a minimum volume of armourstone in the apron of 0.22 × 6.0 × √5 = 2.96 m³ per linear metre of revetment. The apron should be placed at a water depth of 15 m, necessitating high placement tolerances. The behaviour cannot be predicted in detail when a volume of 6 m³ per linear metre of revetment is placed. The text has to be replaced by: "An expected scour of maximum 12 m (see Figure 8.28) would require a minimum volume of armourstone (with D_{n50} = 0.25 m) of 12 x √5 x 0.25 = 6 to 7 m^3 per linear metre of revetment, assuming that a single armourstone layer is formed in accordance with the model tests. The apron is to be placed in water depth of maximum 28 m (at PWD -15 m, see Figure 8.28), necessitating high placement tolerances. In practice, the volume of armourstone placed was therefore far more, up to 40 m^3 per linear metre."
1011	**The two lower bullets are to be placed as 2nd and 3rd bullet earlier on the page, just below** " • for a straight slope …." • for a straight slope of a non-overtopped structure, see Section 5.2.2.2 • for a composite slope, ie with a berm, refer to Section 5.2.2.8. 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 foreshones 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): • 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.
1011	**26th line:** typing error **NOTE:** Armourstone cover layers on structures in very shallow water and gently-sloping foreshones 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 "foreshones" → "foreshores"
1012	**Box 8.3 – 9th line from below:** incomplete reference The result is expressed as an armourstone size required for stability, including a safety coefficient for Maynord's approach. The reader should note that both Pilarczyk's and Escarameia's approaches provide "and Escarameia's approaches" → "and Escarameia and May's approaches"

Page No	Erratum / Correction
1012	**Box 8.3 – 2nd line from below**: typographic error and **last line**: incorrect wording A standard double layer thickness is $2k_t$ D_{n50} (see Section 3.5.1 for values of the layer thickness coefficient, k_t (-)). When small armourstone is required for weak currents, it may be practical to use a thicker layer to sink a geotextile and a fascine mattress. Conversely, assuming a minimum thickness of 0.5 m is required for construction purposes, ie D_{n50} = 0.203 m, the hydraulic stability for this armourstone size may be checked to confirm if sufficient. 1. "D_{n50} = 0.203 m" has to read: "D_{n50} = 0.28 m for k_t = 0.90" 2. "to confirm if sufficient" to read: "to confirm that this size is sufficient."
1024	**2nd line above Table 8.3**: An effectively designed structure should withstand the loads imposed by the river, but other causes of damage should also be considered in the design. Table 8.3, adapted from PIANC (1987b), gives an *aide-memoire* of design measures which can help to overcome or address causes of damage. The aim of these measures is to avoid degradation or to make maintenance easier. "measures which can help to" → "measures that can help to"
1024	**Table 8.3, 4th column, 4th line:** incorrect reference Pack ice | Shearing force on cover layer due to ice-sheets riding up the revetment | Provide cover layer able to withstand load, design procedures are available IAHR (1980) and see Section 5.2.4) "IAHR (1980) → "CRREL (1980)"
1033 *	**Last line of the page / box 8.5:** incorrect figures for return current and wave height; see also errata in Table 8.6, given hereafter The hydraulic loads after design are summarised in Table 8.6. The design parameters are thus the maximum return current and the maximum wave height (see Table 8.6) where selected values for $\hat{U}_r$ and H_i are respectively 1.98 m/s and 0.60 m (see highlighted values in Table 8.6). "selected values for $\hat{U}_r$ and H_i are respectively 1.98 m/s and 0.60 m" has to read: "selected values for $\hat{U}_r$ and H_i are 0.87 m/s and 0.52 m respectively"
1034 *	**Table 8.6 in Box 8.5**: all calculation results are incorrect **Box 8.5** *Example of typical results from a calculation procedure for slope protection due to ship-induced waves (contd)* **Table 8.6** *Main results of calculation* | | Parameter and symbol | Ship A | Ship B | | Step 1 | Maximum ship speed, V_L | 7.27 m/s | 7.75 m/s | | Step 2 | Sailing speed, V_s | V_s = 0.60 V_L = 4.36 m/s | V_s = 0.70 V_L = 5.42 m/s | The correct figures for the two ships A and B are given below:

Page No	Erratum / Correction

Box 8.5 *Example of typical results from a calculation procedure for slope protection due to ship-induced waves (contd)*

Table 8.6 *Main results of calculation*

	Parameter and symbol	Ship A		Ship B	
Step 1	Maximum ship speed, V_L	5.12 m/s		6.35 m/s	
Step 2	Sailing speed, V_s	$V_s = 0.75V_L = 3.84$ m/s		$V_s = 0.75V_L = 4.77$ m/s	
Step 3	Mean water level depression, Δh	0.39 m		0.35 m	
	Mean return velocity, U_r	0.68 m/s		0.43 m/s	
Step 4	Position relative to axis, y	y = 0	y = 30 m	y = 0	y = 30 m
	Max. water level depression, $\Delta\hat{h}$	0.39 m	0.62 m	0.35 m	0.76 m
	Max. return flow, $\hat{U}_r$	0.68 m/s	0.87 m/s	0.43 m/s	0.79 m/s
	Front wave, Δh_f	0.43 m	0.66 m	0.39 m	0.80 m
	Stern wave, z_{max}	0.59 m	0.93 m	0.53 m	1.14 m
	Secondary wave, H_i	0.18 m	0.24 m	0.41 m	0.52 m

1049 **11th line from below:** incorrect reference

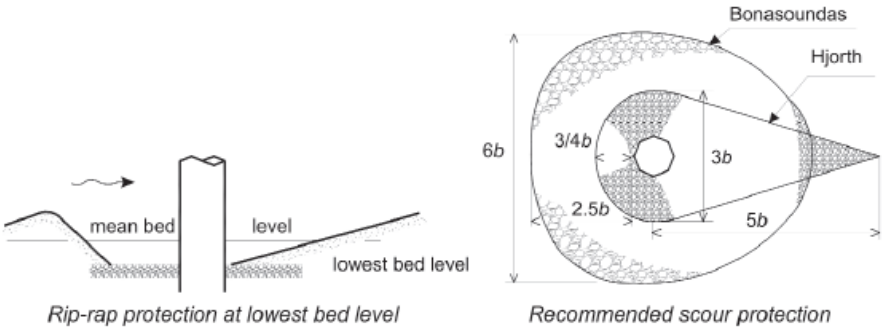
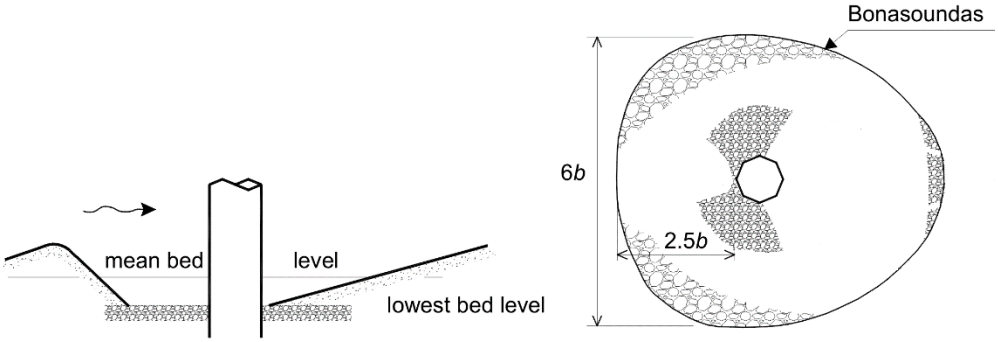
against it, the reader is referred to the *Manual on scour at bridges and other hydraulic structures* (CIRIA, 2002) and/or the *Scour Manual* (Hoffmans and Verheij 1997).

"(CIRIA, 2002)" → "(May et al, 2002)"

1050 **7th, 8th and 11th line from above:** typing errors (M_{50} → D_{50} and $2b$ → $2D_{n50}$) and ambiguous guidance:

- local velocity at the scour protection can be estimated to $v_s \approx 2U$, where v_s is the velocity at the scour (m/s) and U is the depth averaged flow velocity (m/s) (LCPC, 1989)
- median stone size can be estimated as $M_{50} \approx (4/25)U^2$
- minimum extension of protection can be estimated as $2b$ *to* $3b$ from the edges of the pier, each side
- thickness of the protection can be estimated to $2{\cdot}b$.

- 1st bullet: the reference "(LCPC, 1989)" to be deleted.
- 2nd bullet: "median" to be deleted and " as $M_{50} \approx (4/25)U^2$ " has to read: ", based on the Izbash formula (Equation 5.120), as: $D_{50} = 1.4\ (2U)^2/(2g\Delta) \cong (4/25)U^2$ "

Page No	Erratum / Correction
	- 4th bullet: "estimated to $2 \cdot b$." has to read: "estimated to be minimal: $2D_{n50}$."
1051	**Figure 8.51:** incorrect guidance as for the Hjort method; that method to be deleted  *Rip-rap protection at lowest bed level* *Recommended scour protection* **Notes** Bonasoundas (1973) and Hjorth (1975)are given for further reference. b = pier diameter **Figure 8.51** *Example of scour protection of a bridge pier* - The first Note has to read: "Bonasoundas (1973) is given for further reference" - The Figure 8.51 has to be replaced by the Figure below:  *Rip-rap protection at lowest bed level* *Recommended scour protection*
1064	**References Hjort (1975) and LCPC (1989):** to be deleted ~~Hjorth, P (1975). *Studies on the nature of local scour*. Bulletin Series A, No. 46, 1975. Dept. Water Resources Engineering, Lund Institute of Technology, University of Lund, Sweden~~ ~~LCPC (1989). *Les enrochements*. Ministère de l'Equipement, Paris, 106 pp~~
1064	**Reference(s)** IAHR (1980) to be replaced by CRREL (1980) a) To delete: IAHR (1980). *Working group on ice forces on structures*. Special report 80 –26, June b) To insert just above "CUR/TAW (1991) ": "CRREL [Cold Regions Research and Engineering Laboratory] (1980) IAHR Working group on ice forces on structures. Carstens, T. Special report 80-26, June, 153 pp"

<table>
<tr><th>Page No</th><th>Erratum / Correction</th></tr>
<tr><td>1089</td><td>Table 9.4: ambiguous guidance (‘size’ = ‘mass’), and explanatory notes
Table 9.4 Excavator size in relation to stone size
<table><tr><th>Armourstone grading</th><th>Excavator size (t)</th></tr><tr><td>Core material</td><td>15</td></tr><tr><td>1–3 t</td><td>20</td></tr><tr><td>3–6 t</td><td>30</td></tr><tr><td>6–10 t</td><td>45</td></tr><tr><td>10–15 t</td><td>60</td></tr><tr><td>15–20 t</td><td>70</td></tr></table>- One line above the Table to read: “Table 9.4 relates the minimum excavator mass to the various stone gradings.
- Title (caption) to read: “Excavator mass in relation to stone mass”
- Header of 2nd column to read: “Excavator mass for handling (t)”
- Notes to be added below the Table:
Notes:
1 The tabulated data refer to operations with 360 degrees excavators on a horizontal floor, viz quarry handling; in such situations the tabulated gradings are valid for reaches up to 9 m
2 When placing stones in rock structures, ie on slopes, the lifting capacity is substantially smaller than the above data and should be determined by using load charts according to the specifications of the manufacturer</td></tr>
<tr><td>1103 *</td><td>5th line from above: incorrect guidance
… waves do not exceed a height of H_s = 1–1.5 m, roughly corresponding with wind force six on the Beaufort scale, whereas under swell conditions wave heights beyond H_s = 0.5 m can
“with wind force six on the” has to read: “with wind force five on open sea on the “</td></tr>
<tr><td>1107 *</td><td>5th line from below: ambiguous / incorrect guidance; as average thickness may only be applicable for heavy gradings, a better guidance is minimum thickness
For slope protection and breakwater construction the average thickness of the armour layer, which is usually a double layer, is designed as $2k_t D_{n50}$, both below and above water. Typical …
“the average thickness of” has to read: “the minimum thickness of “</td></tr>
<tr><td>1108 *</td><td>6th line from above: incorrect guidance; model testing is normally with thickness of at least two times the nominal size
and overtopping. The formulae used to calculate these hydraulic properties are largely based on model testing with two layers of armourstone, which rarely if ever reach $2D_{n50}$.
“, which rarely if ever reach $2D_{n50}$.” has to read: “ with a thickness that rarely if ever is less than $2D_{n50}$.”</td></tr>
</table>

Page No	Erratum / Correction
1122 *	**7th line from above**: additional guidance example, if the return period of an extreme event is five years and the construction period is also five years then there is a probability of 67 per cent (1 - (1 - 0.2)^5) that this event will occur during the construction period (see also Table 2.4 in Section 2.3.3.2). "67 per cent (1 – (1 – 0.2)^5) that this" has to read: "67 per cent (= 1 – (1 – 0.2)^5; see Equation 4.116) that this"
1124	**11th line from below:** incorrect reference **Specific health and safety provisions (Cork and Cruickshank, 2005)** "(Cork and Cruickshank, 2005)" → "(Cruickshank and Cork, 2005)"
1140	**8th line from above:** unclear guidance The capacity of a crane is determined by the maximum mass of stones plus container at the longest reach, ie M_{97} of the stone grading. Ultimately, the stones at the toe and the berm of "M_{97}" → "the *EUL* value"
1142 *	13th line from above: unclear guidance For floating equipment, the water depth and the exposure to swell and/or waves and currents are important factors affecting overall downtime during construction. "to swell and/or waves" has to read: "to swell and/or wind-sea waves"
1146 *	**8th line**: unclear (incorrect) guidance The breakwater slope should be properly profiled and, to facilitate placement, the mass of the armourstone in the underlayer should not exceed 15 per cent of the armour unit mass "the mass of the armourstone" → "the M_{50} value ~~median mass~~ of the armourstone"
1163	**3rd line from below:** typographic error • the surveyed armour layer volume, V_{bs}, corrected to spherical end $0.5D_{n50}$ probe method. The chainage length is multiplied by the average area enclosed between the upper and lower surveyed surface of the armour layer (see Equation 3.17, $V_{bs} = A_{cs}L$). "(see Equation 3.17," → "(see Equation 3.24,"
1164	**2nd line above Equation 9.10** apparent rock density, then an appropriate basis for payment of the panel (see Equation 3.19: $V_r = V_b\,(1 - n_v)$) is given by Equation 9.10, an expression for the total mass of the armour, M_t. "(see Equation 3.19" → "(see Equation 3.26"

Page No	Erratum / Correction
1183	**4th line below Equation 10.1**: incomplete guidance Minimise $\{I + \mathrm{PV}(M) + \mathrm{PV}(R) + \mathrm{PV}(P_F C_F)\}$ (10.1) where: I = investment in the structure PV = present value (see Equation 2.2) M = cost of monitoring R = cost of repair or replacement P_F = probability of failure C_F = cost involved with failure. "*M* = cost of monitoring" has to read "*M* = cost of monitoring and maintenance"
1187 *	**5th line from above**: incorrect wording **Repair** implies that damage has occurred and structure functionality is significantly reduced. Rebuilding a slumped armoured slope, resetting breakwater crown blocks and backfilling eroded fill could be considered structure repair. Repair can also be thought of as corrective "eroded fill" has to read: "eroded spots"