Scour Manual 2021 - Errata

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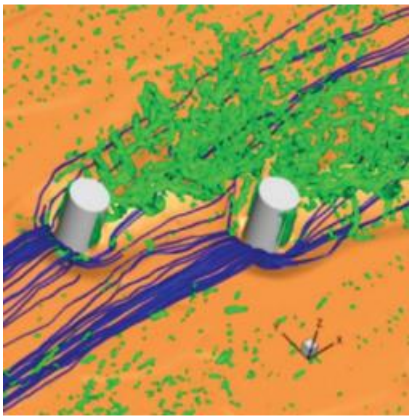
Page No	**Erratum / Correction**
Page after title page	**Condition not correct**: change “publishers nor the author” into “publisher nor the author” The correct condition is: Although all care is taken to ensure integrity and the quality of this publication and the information herein, no responsibility is assumed by the **publisher nor the authors** for any damage to the property or persons as a result of operation or use of this publication and/or the information contained herein.
5	**Add new paragraph at the end of section describing content of Chapter 9:** These case studies have been written by consultants, contractors, Deltares and Rijkswaterstaat, who are responsible for their own content. Therefore, these contributions do not necessarily yield to the most appropriate design as not always formulas and design methods are used, which are part of this manual.
14	**2nd line from below**: incorrect formula var = 0.33*b*/1.5*b* = 0.22 → var = 0.33*b*/1.4*b* = 0.24
15	**Sentence below Equation 2.3:** change sentence into: “The failure probability P_f can be determined from a table with the standard normal or Gaussian distribution if the reliability index β is computed:”
16	**4th line from below:** incorrect reference to table strength parameters (Table 2.4) → strength parameters (Table 2.5)
17	**Incorrect table number:** Table 2.4 Protective measures → Table 2.5 Protective measures
17	**4th line from below:** incorrect reference to table collars) listed in Table 2.4 → collars) listed in Table 2.5
21	**Below Equation (2.4)**: incorrect reference (see Table 3.4) → (see Table 3.5)
22	**8th line from below:** incorrect reference to table Table 2.5 presents average values → Table 2.6 presents average values
23	**4th line from below:** incorrect reference to table parameters (see Table 2.6) → parameters (see Table 2.7)
23	**Incorrect table number:** Table 2.6 Characteristic values for the all parameters → Table 2.7 Characteristic values for the all parameters
24	**19th line from above:** incorrect reference to table Table 2.6 shows that the standard deviation → Table 2.7 shows that the standard deviation
25	**Incorrect table number:** Table 2.7 Scour depth with certainty when the average scour depth is 1.215 m → Table 2.8 Scour depth with certainty when the average scour depth is 1.215 m

Page No	**Erratum / Correction**
25	**Text below Table 2.8 (13th to last line from below)**: unclear text, furthermore incorrect references to table and equation. New text: be 1.215 + 0.531 = 1.746m (see 5th column). Instead of this probabilistic computation it is also possible to compute the critical scour depth with a safety factor as proposed by Johnson (1992) using Equation (2.2). He states that for a failure probability of 10% the safety factor is 1.2 (see Table (2.2). Accordingly, if the average scour depth is equal to 1.215m the design scour depth would be 1.215 x 1.2 = 1.458m (see 6th column). However, this calculation was carried out with the average value (exceedance chance 50%), a better (more realistic to normal calculations) comparison is to calculate the scour depth with the characteristic value (exceedance chance 5%), which would result in (1.215 + 1.65 x 0.415) x 1.2 = 2.280m (see 7th column) (Note: the value of 1.65 corresponds with 5% exceedance probability). The calculations were made for multiple probability failure rates, as shown in Table 2.8. Column 5 provides results based on a probabilistic computation, while columns 6 and 7 show results based on the safety factor according to Johnson for the corresponding failure probability. The values used for the parameters in Equation (2.6) are shown in Table 2.6. As shown in this example, the probabilistic method can prove to be a useful tool to remove some conservatism. Column 5 in Table 2.8 shows for a probabilistic calculation higher values than the values based on the safety factor according to Johnson in column 6 with an average value, and thus higher risk of exceedance, but lower values than the values in column 7 with the more conservative approach with a characteristic values.
26	**3rd line from above**: incorrect sentence Presence of a structure a decreasing dimension of the flow channel results in higher flow velocity and lower turbulence intensity. → Presence of a structure **or** a decreasing dimension of the flow channel results in higher flow velocity and lower turbulence intensity.
28	**Figure 3.2**: incorrect symbols l → ℓ and η_k → ℓ_k (ℓ refers to the length scale of the vortices)
30	**Figure 3.3a**: Legend lacks - upstream of the piles there is hardly any turbulence: streamlines are blue - downstream of the piles the flow is turbulent: vortices are green 

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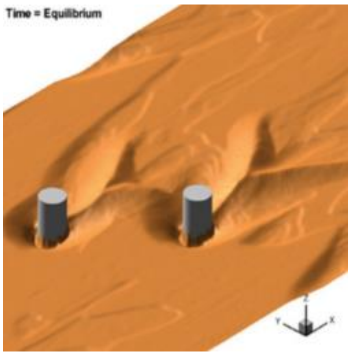
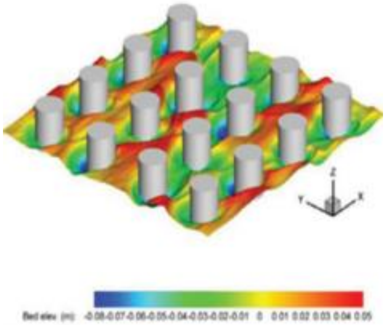
30	**Figure 3.3b**: legend is incorrect Time = Equilibrium → scour holes are in equilibrium phase 
30	**Figure 3.3c**: legend is confusing/not readable  →  bed level (cm) -8 -6 -4 -2 0 2 4 6
31	**3rd line from above**: sentence is incorrect The computational cost of DNS is very high, … → The computational **costs of DNS are** very high, …
31	**2nd line from below**: sentence is incomplete Following de Wit (2006), SPH can be used in many different situations in hydraulic engineering. → Following de Wit (2006), SPH **(= Smoothed-Particle Hydrodynamics)** can be used **for simulating the mechanics of continuum media, such as solid mechanics and fluid flows.**
33	**Sentence above Equation 3.2:** reference to Laursen & Toch incorrect, sentence should read: If there is bank overflow with discharge Q_f, Equation (3.1) becomes:
33	**Below symbols below Equation (3.2):** add new text: Note: Equation (3.2) takes into account the morphological change of the bed slope via the sediment transport formula (personal communication Mosselman, 2018). The equation differs from the one presented by Laursen (1960) and slightly modified by HEC-18 (2012) where the discharge ration has a coefficient β. That equation is not correct because it does not take into account the morphological impact.
38	**Figure 3.9**: typographic error in symbols U → U_0
42	**Below Equation (3.14)**: typographic error in notation of Uc U_c = critical depth-averaged flow velocity above the bed → U_c = critical depth-averaged flow velocity of the sand

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42	**Below Equation (3.15)**: typographic error in notation r0,$_{m}$ → $r_{0,m}$
42	**8st line from below:** missing limiting value for Fr C_k = constant dependent on the steepness of the upstream slope (-), 0.03 – 0.045 Add hereafter: The above presented equilibrium scour depth equations are valid for Fr < 1
43	**Below section 3.4.4**: incorrect reference see Figure 3.16 → see Figure 3.17
49	**Figure 3.16**: legend lacks ● particles are in rest ● particles move in the open pores
52	**2nd line below Table 3.3:** limit for the side slope in a two-dimensional geometry. add hereafter new sentence: The angle of repose equals approximately the angle of internal friction.
55	**Section 3.6.1 lines 4 to 6**: sentence is incomplete In Section 3.6.3, the critical slope angles and failure lengths downstream of a hydraulic structure are computed to show the relevance of taking into account sufficient length of the bed protection **and values figures for the internal angle of friction**. → In Section 3.6.3, the critical slope angles and failure lengths downstream of a hydraulic structure are computed to show the relevance of taking into account sufficient length of the bed protection.
57	**Section 4.1 lines 1 to 3**: sentence is unclear Shields (1936) presented the first treatise on initial bed grain instability, referring to Prandtl's and von Kármán's concepts of boundary-layer flow **that are mentioned in the bibliography of this manual** → Shields (1936) presented the first treatise on initial bed grain instability, referring to Prandtl's and von Kármán's concepts of boundary-layer flow **(section 4.3.2).**
60	**Figure 4.2**: typographic error in symbols U_s → U_0
61	**Figure 4.3**: symbol of longitudinal coordinate is absent ⟶ → ⟶ x **Furthermore:** horizontal part of the sill at the left side is missing
61	**3rd line from below**: typographic error is reference (see Equation 6.11) → (see Equation 6.10)
63	**Table 4.2**: typographic error in notation of velocity (*m/s*) → (m/s)

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66	**Figure 4.9**: Typographic errors in symbols Shields parameter or critical mobility parameter, ψ_c → Shields parameter or mobility parameter, Ψ particle diameter D^* → particle diameter D_* particle diameter d_{50} → particle diameter d_{50}
70	**Lines 4 to 7 from below**: standalone sentence without reason The Comprehensive Scour Model (CSM) was first proposed by Bollaert and Schleiss (2003). It has the advantage of considering the physical phenomena involved in the scour of the rock impact ed by plunging water jets. → The Comprehensive Scour Model (CSM) was first proposed by Bollaert and Schleiss (2003). It has the advantage of considering the physical phenomena involved in the scour of the rock impact ed by plunging water jets
72	**6th line from below**: typographic error in symbols ρ_0 → r_0
73	**9th line from above:** delete due to the return current velocity just above the bed due to the return current (m/s) → critical velocity just above the bed (m/s)
73	**12th and 13th line from above:** change sentences The resistance coefficient c_f depends on the return current. Delft Hydraulics (1988) provides accurate equations for a final design. Into: Equation (4.17) can also be used in case of the return current under a ship. Delft Hydraulics (1988) provides accurate equations for c_f for the flow under a ship for a final design
73	**Equation (4.16)**: Typographic error in symbol $U0,c$ → U_c
73	**Below Equation 4.17**: Typographic error in notation of $U_{b,c}$ water velocity just above the bed due to the return current (m/s) → critical flow velocity just above the bed (m/s)
73	**Equation 4.18**: typographic error of critical Shields parameter ψ_c → Ψ_c
75	**5th and 6th line from above:** incorrect reference Also the steepness of a slope will increase (see Section 3.4) → Also the steepness of a slope will increase.
76-77	**Section 4.4.3**: typographic error in angle of internal friction Several times: ϕ → ϕ'
77	2nd paragraph: typographic error in symbol c → C_0

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78	**Figure 4.15**: typographic error in symbols τ_{cr} → τ_c PI → *PI* Winterwerp, → Winterwerp
78	**Below Equation (4.22)**: reference lacks in which *LL* = liquid limit → *LL* = liquid Limit (www.soilmanagementindia.com/soil/determination-of-liquid-limit/how-to-determine-the-liquid-limit-of-soils/13363)
78	**Figure 4.16**: typographic error in equation PI = 0.73(LL – 20) → *PI* = 0.73(*LL* – 20)
79	**Figure 4.17**: typographic errors in axises estimated critical shear stress (N/m^2) → critical shear stress, τ_c in N/m^2 undrained compressive strength (kN/m^2) → unconfined compressive strength, q_u in N/m^2
79	**Figure 4.17**: header and reference lacks Critical shear stress versus undrained compressive strength → Critical shear stress versus unconfined compressive strength (FHWA, 2015)
79	**Equation (4.23) not correct:** exponent 2 should be -2 and f_u should be q_u $\tau_c = \alpha_c \left(\frac{w}{F}\right)^{2.0} PI^{1.3} f_u^{0.4}$ Improved equation: $\tau_c = \alpha_c \left(\frac{w}{F}\right)^{-2.0} PI^{1.3} q_u^{0.4}$
79	**8th and 9th line from below:** add definition of q_u and change definition f_u: *F* = fraction of fines of the soil smaller than 0.075 mm (–) f_u = undrained compressive strength (N/m^2) change into”: *F* = fraction of fines of the soil smaller than 0.075 mm (–) q_u = unconfined compressive strength (N/m^2); $q_u = 2f_u$ f_u = undrained shear stress (N/m^2)
79	**3th and 4th line from below:** In Equation (4.23) and Figure 4.17, the undrained shear strength f_u is used. The undrained shear strength $f_{\underline{u}}$ can be determined with the DSS test (Figure 4.14). Change into: In Equation (4.23) and Figure 4.17, the unconfined compressive strength q_u is used. This value can be computed via the undrained shear strength f_u which can be determined with the DSS test (Figure 4.14).
80	**1st line Section 4.4.5:** add reference can be used (Osman & Thorne, 1988): →can be used (Osman & Thorne, 1988)(Thorne, 1993):

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80	**Equation (4.24):** term τ_c is too much and should be deleted, and ρ_b →ρ_s $\frac{dz}{dt}=\frac{R}{\rho_b \cdot g}\cdot\tau_c\left(\frac{\tau_0}{\tau_c}-1\right)$ and $R=0.364\cdot\tau_c\cdot e^{-1.3\cdot\tau_c}$ Becomes $\frac{dz}{dt}=\frac{R}{\rho_s \cdot g}\left(\frac{\tau_0}{\tau_c}-1\right)$ and $R=0.364\cdot\tau_c\cdot e^{-1.3\cdot\tau_c}$
80	**Halfway page 80**: typing error The values of the bottom shear stress τ_0 and the critical bottom shear stress τ_b → The values of the bottom shear stress τ_0 and the critical bottom shear stress $\boldsymbol{\tau_c}$
85	**1st line from above**: reference error See Equation (4.7) and (4.27) → See Equations (4.7) and (4.26)
86	**4th line from below**: typing errors $\rho_s = 2000$ → $\rho_s = 2650$ $U_c = 1.75$ → $U_c = 1.81$
90	**Below Equation (5.2)**: reference error (see also Equation 5.17) in Section 5.5.2) → (see also Equation 5.18) in Section 5.5.2)
93	**2nd line from above**: reference error (see also Section 5.5.2) →(see also Section 3.4.2)
93	**Above Section 5.4**: typing error α →α_F
93	**4th line from below**: typing error $\mathrm{c_s} = 4.75\ (m^{0.16}\mathrm{s}^{0.57})$ → $c_s = 4.75\ (\mathrm{m}^{0.16}\mathrm{s}^{0.57})$
94	**Figure 5.4e**: typing error in symbol U_t → U_1
95	**Equation (5.10)**: typing error in symbol ϕ → ϕ
101	**Section 5.5.3 last sentence:** add reference "….manuals, for example Rajaratnam, 1976."
102	**Above Section 5.6.2**: reference error …presented in Section 5.7.2… →…presented in Section 5.6.2…
106	**Last line above Figure 5.13**: sentence is unclear …propeller jet for a situation with probably a small keel clearance. →…propeller jet for a situation with a small keel clearance.

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106	**Figure 5.13:** text at axises of the small figures are unreadable: Horizontal axis: distance from the left bank (m) Vertical axis: bed elevation (m) Furthermore, add to header: observed maximum scour about 0.5m
109	**2nd line from below:** explain ro-ro vessels …and ro-ro (roll-on roll-off) vessels because…
112	**11th line from below**: reference error (see Section 3.4) → (see Section 3.5)
114	**Above Section 5.10**: Add reference The length varies between 1 to 5 m for small structures. → The length varies between 1 to 5 m for small structures (Figure 5.11).
115	**4th line from above**: typographic errors in formula sin q → sin θ
115	**Halfway page 115**: reference error Then substituting all values into the Dietz Equation (5.17) gives: → Then substituting all values into the Dietz Equation (3.16) gives:
117	**5th and 11th line from above**: type error in symbol D → Δ (= relative density)
118	**4th line from below**: error in formula $b_u = y_l/m$ → $b_u = y_1/\mu$
119	**2nd line from above**: error in symbol h_0 → h_t
124	**5th line from above**: incorrect sentence Subsequently, the scour capacity is larger than under Live Bed Scour (LBS) conditions. In practice, this means that the measured scour depth in a flume is larger than in reality because the scour capacity is larger. → Although the scour capacity is large the erodibility of clay is marginal and therefore, the erosion process of these cohesive layers is relatively long. If the relative thin clay layers have been eroded then the erosion of the Pleistocene sand (d < 0.2 mm) continues immediately.
125	**Above Equation (6.2)**: incorrect sentence In the development phase, when t is smaller than t_1, Equation (6.1) reduces to: → In the development phase, when t is smaller than t_1, the maximum scour depth is:
127	**Below Equation (6.5)**: typing error critical depth-averaged flow velocity above the bed → critical depth-averaged flow velocity
128	**2nd line from below**: reference error Equation (6.9) → Equation (6.7)

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130	**2nd line from above**: typing error r_0 → r_0 r_{0} → r_0
134	**Above Equation (6.14)**: reference error Equation (6.8) → Equation (6.7)
136	**Figure 6.10:** change header: Schematic representation of reduction method (computation with Equation 6.20)
139	**Lower part Figure 6.11:** incorrect values horizontal axis 0.0 0.5 1.0 1.5 2.0 2.5 → 0.0 0.1 0.2 0.3 0.4 0.5
140	**4th and 5th line from above**: grammar error According to Konter et al. (1992), a failure length equal eight times the maximum scour depth can be conceived as … → According to Konter et al. (1992), a failure length which is eight times the maximum scour depth can be conceived as …
144	**3rd line from below**: reference error Equation (6.17) → Equation (6.16)
151	**Halfway page 151**: formula error $y_{m,e,} = h_0 \times (1 + 3r_0) \text{ x } U_d – U_c/U_c = 25 \times [(1 + 3 \times 0.15) \text{ x } 1.2 - 0.41]/0.41 = 81 \text{ m}$ → $y_{m,e,} = h_0 \times [(1 + 3r_0) \text{ x } U_d – U_c]/U_c = 25 \times [(1 + 3 \times 0.15) \text{ x } 1.2 - 0.41]/0.41 = 81 \text{ m}$
159	**2nd and 3th line from below**: incorrect sentence … which is valid for all phases of scour development, provided $y_{m,e} > h_0$ (also Equation 3.6): →… which is valid for all phases of scour development, (also Equation 3.6):
160	**4th line from above**: incorrect sentence characteristic time (s) at which $y_m = h_0$ as long as $y_{me} > h_0$ → characteristic time (s) at which $y_m = h_0$
160	**Above Equation (7.2)**: reference error also Equation (4.7) → also Equation (3.7)
168	Below Equation (7.15): formula error $y_{m,e} = 4.5h$ → $y_{m,e} = 4.5h_0$ $y_{m,e} = 10h$ → $y_{m,e} = 10h_0$
168	**12th and 11th line from below**: incomplete sentence incorrect reference which is comparable with an extreme high relative turbulence of 0.37, see also Equation 7.15. → which is comparable with an extreme high relative turbulence of $r_{0,m} = 0.37$ with $r_0 = 0.1$, see also Equation 7.14.

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168	**9th line from below**: typing error is in the extreme case 10*h*/1.5*h* = 6.7 → is in the extreme case 10/1.5 = 6.7
169	**Above Section 7.5**: incorrect sentence However, Equation is difficult to use because for only some of the K parameters values are available → Though Equation (7.16) cannot be used it gives a qualitative insight in abutment scour.
169	**6th line from below**: reference error Section (4.2) → Section (3.3)
170	**3rd line from above**: reference error Section (4.2) → Section (3.3)
170	**4th line from above**: reference lacks Hoffmans and Buschman (2018) … → Hoffmans and Buschman (2018) and Hoffmans et al. (2022) … Hoffmans, G.J.C.M., Buschman, F. & Van der Wal, M. (2022). Turbulence approach for predicting scour at abutments, *Journal of Hydraulic Research*, *60:4*, 588-605, DOI: 10.1080/00221686.2021.2022028
171	**Last line**: grammar error Too steep a scour hole may induce part of the head to slide into the scour … → A too steep scour hole may induce part of the head to slide into the scour …
172	**Figure 7.12**: unclear title  outflanking of groyne along river Waal (9 m/a) 20 maart 2008 →  outflanking of groyne along river Waal
175	**4th line above Table 7.5**: incorrect sentence This maximum equilibrium depth of the scour hole … → This equilibrium depth of the scour hole …
175	**Table 7.5**: typing error $Q\ (m^3/s)$ → Q (m^3/s) h_0 (m) → h_0 (m) →
176	**Formula**: Equation number lacks Equation number is: 7.3
176	**Last paragraph**: incorrect sentence Figure 7.16 shows the dependence of the maximum equilibrium scour hole depth … → Figure 7.16 shows the dependence of the equilibrium scour hole depth …
176	**Last paragraph**: incorrect reference The green dots indicate the measurements for low water on 26 May 2005 in the table → The green dots indicate the measurements for low water on 26 May 2005 (Table 7.5).

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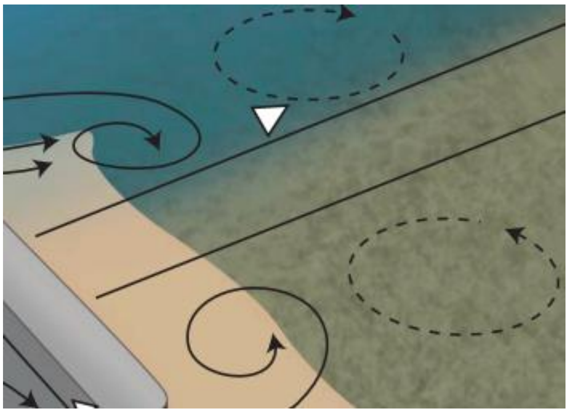
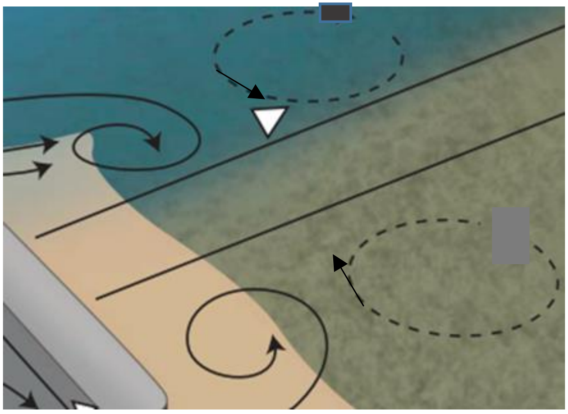
177	**1st line**: improvement sentence Hoffmans and Buschman (2018) present a formula for the equilibrium depth of combined scour due to constriction and the presence of the abutment: → According to Hoffmans et al. (2022) the equilibrium scour depth of combined scour due to constriction and the presence of the abutment is:
177	**Below Equation (7.17)**: reference error Equation (7.19) → Equation (7.18)
180	**Figure 8.2**: incorrect flow arrows  → 
182	**5th line from below**: reference error Section 3.4.4 → Section 3.4
183	**Above Equation (8.2)**: improvement sentence Equation (8.1) reduces to (Figure 8.5): → the maximum scour depth is:
184	**Below Equation (8.3)**: reference error Equation (6.9) → Equation (6.7)
185	**Below Equation (8.4)**: reference error where K_i = correction factor; see Section 7.9 (for circular piers: $K_i = 1.0$). → where K_i = correction factor; for circular piers: $K_i = 1.0$, also see Table 7.4.
186	**Below Equation (7.8)**: typing error $\mathrm{K_L}$ → K_L

<table>
<tr><th>Page No</th><th>Erratum / Correction</th></tr>
<tr><td>189</td><td>Equation (8.20): Formula error
y_m → $y_{m,e}$</td></tr>
<tr><td>190</td><td>Figure 8.9: legend is unclear
Red curve in graph represents the pressure scour, however, in the legend the proposed curve is black. Red = black.</td></tr>
<tr><td>190</td><td>Below Figure 8.9:
V_{ue} = effective critical velocity in case of case 3 (m/s) → V_{ue} = effective critical velocity in case 3 (m/s)
Z = scour number (-), defines as $Z = (h_b + y_{m,e})/(h_b + a)$, see Equation (8.20) and vertical axis in Figure (8.9)</td></tr>
<tr><td>191</td><td>7th line from above: reference error
Equation (8.11). → Equation (8.6)</td></tr>
<tr><td>192</td><td>Last line: incomplete sentence
… the spacing between the piers is more than 3<i>b</i> to 11<i>b</i>.
→… the spacing between the piers is more than 3<i>b</i> to 11<i>b</i> (Table 8.3).</td></tr>
<tr><td>193</td><td>Table 8.2: symbol error
$\mathrm{K_s}$ → K_s</td></tr>
<tr><td>193</td><td>Figure 8.10: symbol error
subscript ω → subscript <i>ω</i> (3 times)</td></tr>
<tr><td>195</td><td>Table 8.3: shown figures are incorrect
Replace by Table by:

Table 8.3. The factor K_{gr} for a group of 2 circular piers.
<table>
<tr><th>Flow direction</th><th>Pier position</th><th><i>Pier spacing</i></th><th>Front pier</th><th>Rear pier</th></tr>
<tr><td>→</td><td></td><td><i>1b</i>
2 to 3<i>b</i>
>15b</td><td>1.0
1.15
1.0</td><td>0.9
0.9
0.8</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>→</td><td></td><td>1<i>b</i>
5<i>b</i>
>8<i>b</i></td><td>1.9
1.15
1.0</td><td>1.9
1.2
1.0</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>→</td><td></td><td>1<i>b</i>
2 to 3<i>b</i>
>8<i>b</i></td><td>1.9
1.2
1.0</td><td>1.9
1.2
1.0</td></tr>
</table></td></tr>
<tr><td>197</td><td>Figure 8.12: typing errors
Cross-section A – A → Cross-section A – B</td></tr>
</table>

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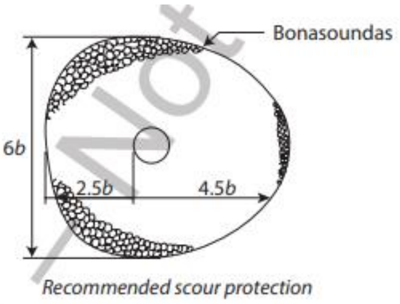
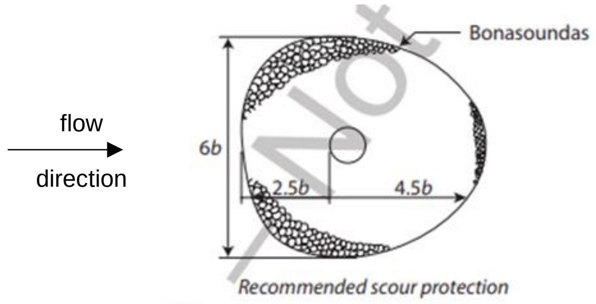
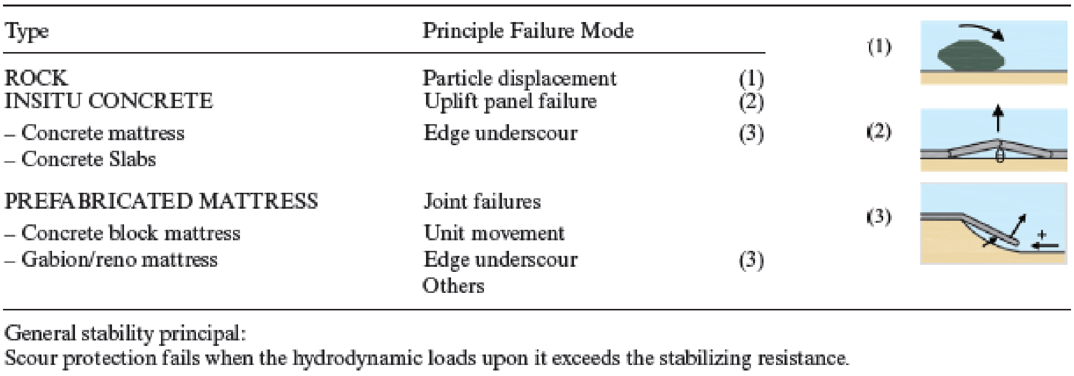
198	**Figure 8.14**: figure improvement  Figure 8.14 Recommended riprap protection.  Figure 8.14 Recommended riprap protection.
198	**1st paragraph**: incomplete sentences None of these publications included any information about the angle of repose, so the angle has been estimated. For the estimates we assumed that in the laboratory tests the sand had a loose compaction and that in prototype situations, after many years of consolidation, the soil had a firm compaction. → The angle of repose varies from 30 (fine sand) to 45 degrees (coarse sand). Therefore, the steepness of scour slopes lies in the range of 1V:1.7H to 1V:1H. However, experimental research and field observations show that the steepness of scour slopes in small-scale tests is steeper than in field observations.
200	**Figure 8.16**: typing error Number of layers $\mathrm{D_F/d_{50f}}$ [-] → Number of layers D_F/d_{50f} [-]
201	**6th line from above**: notation error medium filter size → medium grain size in filter layer
201	**7th line from above**: add after "…report CUR233 (2010)." the sentence: "See Figure 8.14 for the area around the pier that should be protected."
202	**Above Section 8.7.3**: reference error Zanke (1994) proposed a self-filling riprap protection system using a reservoir in the pile (Figure 8.14). → Zanke (1994) proposed a self-filling riprap protection system using a reservoir in the pile.

<table>
<tr><th>Page No</th><th>Erratum / Correction</th></tr>
<tr><td>202</td><td>Table 8.4: incorrect figure upper right and in column “Principle Failure mode” text “Uplift pale failure (2)” incorrect and should be “Uplift panel failure (2)”

Replace table by

<table>
<tr><th>Type</th><th>Principle Failure Mode</th><th></th></tr>
<tr><td>ROCK</td><td>Particle displacement</td><td>(1)</td></tr>
<tr><td>INSITU CONCRETE</td><td>Uplift panel failure</td><td>(2)</td></tr>
<tr><td>– Concrete mattress</td><td>Edge underscour</td><td>(3)</td></tr>
<tr><td>– Concrete Slabs</td><td></td><td></td></tr>
<tr><td>PREFABRICATED MATTRESS</td><td>Joint failures</td><td></td></tr>
<tr><td>– Concrete block mattress</td><td>Unit movement</td><td></td></tr>
<tr><td>– Gabion/reno mattress</td><td>Edge underscour</td><td>(3)</td></tr>
<tr><td></td><td>Others</td><td></td></tr>
</table>

General stability principal:
Scour protection fails when the hydrodynamic loads upon it exceeds the stabilizing resistance.</td></tr>
<tr><td>203</td><td>Section 8.8 Examples: typing error
8.8 Example → 8.8 Examples</td></tr>
<tr><td>205</td><td>Table 8.5: typing errors
r_0 → r_0
r_0 (-) → r_0 (-)
$\mathrm{r}_{0,m}$ (-) → $r_{0,m}$ (-)
U_0 (m/s) → U_0 (m/s)
U_c (m/s) → U_c (m/s)
χ_e (-)→ χ_e (-)
$y_{m,e}$ (m) → $y_{m,e}$ (m)</td></tr>
<tr><td>205</td><td>Table 8.5: typing errors
r_0 → r_0
b (m) → b (m)
r_0 (-) → r_0 (-)
$\mathrm{r}_{0,m}$ (-) → $r_{0,m}$ (-)
χ_e (-)→ χ_e (-)
$y_{m,e}$ (m) → $y_{m,e}$ (m)</td></tr>
<tr><td>205</td><td>Below Table 8.5: incorrect sentence

Note that these scour depths are much smaller than the computed scour with the new Breusers Equations (8.11) to (8.13) …
→ For $r_{0,m} > 0.25$, the scour depths obtained from Equations (8.11) to (8.13) are larger than scour depths using the classical formulas …</td></tr>
<tr><td>205</td><td>Figure 8.18: value $\mathrm{r}_0 = 0.2$ in legenda incorrect
Clear water scour r_0=0.2 and Live-bed scour r_0=0.2:
→Clear water scour $r_0 = 0.15$ and Live-bed scour $r_0 = 0.15$:</td></tr>
<tr><td>206</td><td>Table 8.9: reference to equation in header incorrect
Table 8.9 Live bed scour with Equation 8.6
→Table 8.9 Live bed scour with Equation 8.9</td></tr>
</table>

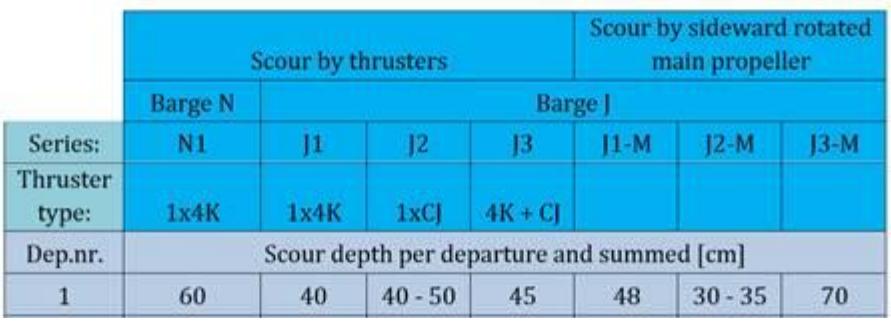
Page No	**Erratum / Correction**
206	**Below Figure 8.19**: incorrect sentence, delete the following: ~~Note that in Equations (8.11) and (8.12) the same values for the coefficients have been used while in Section 3.4.3 is stated that they are unknown for wide piers.~~
206	**Last line**: typing error equilibrium → equilibrium
207	**Table 8.10 and 8.11**: typing errors r_0 → r_0 $b\ (m)$ → b (m) r_{0} *(-)* → r_0 (-) $r_{\mathit{0},m}$ *(-)* → $r_{0,m}$ (-) U_{0} *(m/s)* → U_0 (m/s) U_c *(m/s)* → U_c (m/s) χ_e *(-)*→ χ_e (-) $y_{m,e}\ (m)$ → $y_{m,e}$ (m)
207	**Halfway page 207**: typing error 7 *m* → 7 m 20*m* → 20 m
207	**Figure 8.20:** Clear water scour r_{0}=0.2 and Live-bed scour r_{0}=0.2: →Clear water scour r_0 = 0.15 and Live-bed scour r_0 = 0.15:
208	**Table 8.12 - 8.14**: typing errors $b\ (m)$ → b (m) h_{0} *(-)* → h_0 (-) $y_{m,e}\ (m)$ → $y_{m,e}$ (m) K_i *(-)* → K_i (-) U_{0} *(m/s)* → U_0 (m/s) Fr *(-)* → Fr (-)
208	**Figure 8.21**: typing error h_0 → h_0
209	**1st paragraph**: typing errors 7 *m* → 7 m 10*m* → 10 m $\mathrm{r}_{0,m}$ → $r_{0,m}$
223	**6th line from above:** incorrect reference: with Equation (6.15) → with Equation (6.14)
223	**Equation (6.15):** wrong equation number (6.15) → (6.14)
224	**Equation (6.14):** wrong equation number (6.14) → (6.13)

<table>
<tr><th>Page No</th><th>Erratum / Correction</th></tr>
<tr><td>225</td><td>3rd , 5th and 7th line from above: wrong reference to equation
Equation (6.14) → Equation (6.13)</td></tr>
<tr><td>225</td><td>Figure 9.9: wrong reference in header;
Equation (6.14) → Equation (6.13)</td></tr>
<tr><td>227</td><td>Equation (4.26): wrong equation number
(4.26) → (4.25)</td></tr>
<tr><td>227</td><td>2nd line above Equation(4.24): reference to Thorne (1993) incorrect
to Osman and Thorne (1988) and Thorne (1993) (see Section 4.4.5). →
to Osman and Thorne (1988) (see Section 4.4.5).</td></tr>
<tr><td>227</td><td>Equation (4.24): term τ_c is too much and should be deleted

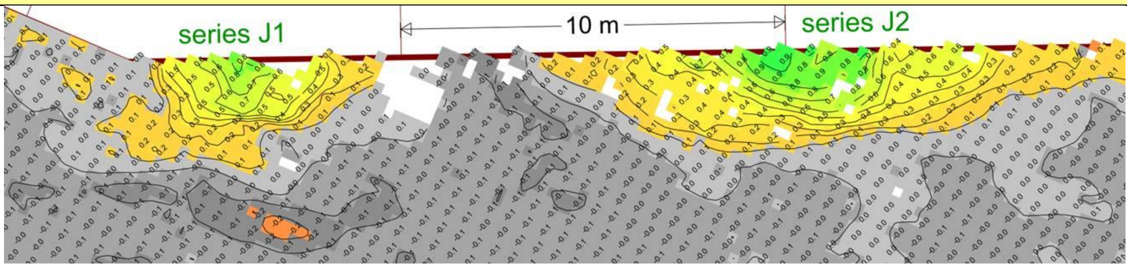
$$\frac{dz}{dt}=\frac{R}{\rho_b\cdot g}\cdot\tau_c\left(\frac{\tau_0}{\tau_c}-1\right)\text{ and }R=0.364\cdot\tau_c\cdot e^{-1.3\cdot\tau_c}$$

Becomes

$$\frac{dz}{dt}=\frac{R}{\rho_b\cdot g}\left(\frac{\tau_0}{\tau_c}-1\right)\text{ and }R=0.364\cdot\tau_c\cdot e^{-1.3\cdot\tau_c}$$
</td></tr>
<tr><td>234</td><td>Table 9.5: the text “scour by sideward rotated main propeller” refers to columns J1-M, J2-M and J3-M only, and the results in the columns J1, J2 and J3 refer to “scour by thrusters”
Correct upper part of Table 9.5:



<table>
<tr><td></td><td colspan="4">Scour by thrusters</td><td colspan="3">Scour by sideward rotated main propeller</td></tr>
<tr><td></td><td>Barge N</td><td colspan="6">Barge J</td></tr>
<tr><td>Series:</td><td>N1</td><td>J1</td><td>J2</td><td>J3</td><td>J1-M</td><td>J2-M</td><td>J3-M</td></tr>
<tr><td>Thruster type:</td><td>1x4K</td><td>1x4K</td><td>1xCJ</td><td>4K + CJ</td><td></td><td></td><td></td></tr>
<tr><td>Dep.nr.</td><td colspan="7">Scour depth per departure and summed [cm]</td></tr>
<tr><td>1</td><td>60</td><td>40</td><td>40 - 50</td><td>45</td><td>48</td><td>30 - 35</td><td>70</td></tr>
</table>
</td></tr>
<tr><td>235</td><td>Halfway of the page: wrong reference to equation
Equation (4.9) → Equation (3.9)</td></tr>
<tr><td>235</td><td>Halfway of the page: wrong reference to figure
Figure 9.14 → Figure 9.15</td></tr>
<tr><td>236</td><td>Figure 9.16: note below heading incorrect, thus
Delete: ~~Note: scour contour lines every 0.1 m~~</td></tr>
<tr><td>236</td><td>Figure 9.17: scour values are not correct → correct figure:</td></tr>
</table>

Page No	**Erratum / Correction**
	
237	**Table 9.6:** wrong reference Equation (5.20) → Equation (5.22) Furthermore: delete reference ~~(6.27)~~
237	**1st line below Table 9.6:** wrong reference Equation (9.3) → Equation (9.5)
241	**2nd line from above:** wrong reference Equation (9.4) → Equation (9.3)
249	**2nd, 3rd and 4th line from above:** correct reference: Equation (4.14) in the previous scour manual (Hoffmans & Verheij, 1997) to more than 100 m with Equation (5.18). It was …. → Equation (5.17) to more than 100 m with Equation (5.16). It was…
249	**5th line from above:** wrong reference Equation (5.17) → Equation (5.18)
253	**2nd line from above:** incorrect reference Figure 8.14 → Figure 8.12
253	**Halfway of the page:** incorrect figure $L/y_{m,e}$ = 65/13.5 = 4.8 → $L/y_{m,e}$ = 66/13.5 = 4.8
253	**Halfway of the page:** incorrect references Table 3.4 → Table 3.5 Table 4.4 → Table 3.5
253	**Last paragraph section 9.8.4:** improvement of text The bypass was designed ………failure cannot be excluded. Change into: The bypass was designed for high discharges and then an extreme scour depth might occur of 13.5 m. This results without safety factor in the criteria of Table 3.5 in a ratio $L/y_{m,e}$ = 66/(2 x 13.5) = 2.4, which means that a shear failure cannot be excluded. However, the criteria include already a safety factor of 2. Thus, the result of $L/y_{m,e}$ = 2.4 is not correct because then the safety factor has been taken into account twice.
258	**Above Equation 8.17:** wrong reference Section 8.4.2 → Section 8.4.3
258	**Equation (8.20):** Formula error y_m → $y_{m,e}$

Page No	Erratum / Correction
263	**13th line from below:** incorrect reference to equation Equation (5.6) for live-bed scour → Equation (6.4 and 6.5) for live-bed scour
265	**4th line from above:** 9 m should be 11 m
265	**6th line from below:** replace “”which is the same as observed” by “which is somewhat lower than observed”
265	**3rd line from below:** incorrect reference to equation Hoffmans formula (Equation 6.4) → Hoffmans formula (Equation 6.3)
266	**3rd to 7th line below Equation (3.16): incorrect figures used to compute scour depth:** For the coarse sand of the river Maas (d_{50} = 0.4–2mm), Uc ranges from 0.4 to 0.6m/s (see Table 5.19 in CIRIA/CUR/CETMEF, 2007). In the CFD computation, the average flow velocity U_0 is approximately 6m/s at section D (O’Mahoney, 2018). Then, Equation (3.16) for the clear-water equilibrium scour depth ($y_{m,e,CL}$) results in a range of 48–74m. Change into”: For the coarse sand of the river Maas (d_{50} = 1mm; see Equation (4.12)), Uc is 0.6m/s (see Table 5.19 in CIRIA/CUR/CETMEF, 2007). In the CFD computation, the average flow velocity U_0 is approximately 5m/s at section D (O’Mahoney, 2018). Then, Equation (3.16) for the clear-water equilibrium scour depth ($y_{m,e,CL}$) results in a range of 39m.
266	**11th to 6th lines from below:** not correct text An alternative is to compute the live-bed equilibrium scour depth ($y_{m,e,LB}$) using Equation (6.18). First, we compute the volume of the scour hole (VCL) with ca = 5 for clear-water scour. Using this volume in the same equation with c_a = 22 for live-bed scour, the live-bed equilibrium scour depth ($y_{m,e,LB}$) can be calculated as $y_{m,e,LB} = \sqrt{\frac{V_{CL}}{22}} = \sqrt{\frac{5y^2_{m,e,CL}}{22}}$ This results in a range of 23–35m, which is far too high compared to observed. Replace by: An alternative approach using the reduction method, described in Section 6.3.7., and time dependent scour development (Equation 3.6) for 10 days (flood duration) with the Dietz equilibrium scour depth as a maximum depth also resulted in an overestimated scour depth mainly because the Dietz formula overestimated the scour depth and the reduction with sediment supply is insufficient to correct this. However, it is not quite clear if the Dietz formula is applicable for live bed scour.