

## **The Rock Manual 2007 (c683) – digital version**

The digital version of the Rock Manual is available on CD with the printed book. It can also be downloaded from the CIRIA website.

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Figures of Chapter 2:

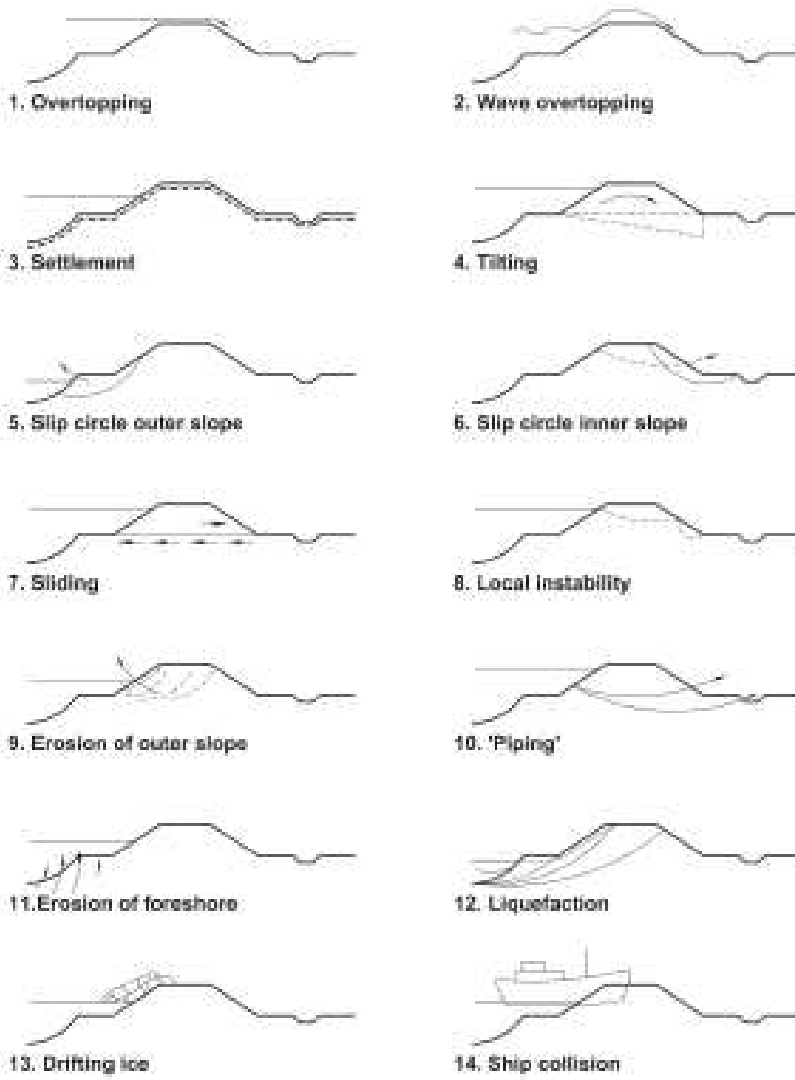


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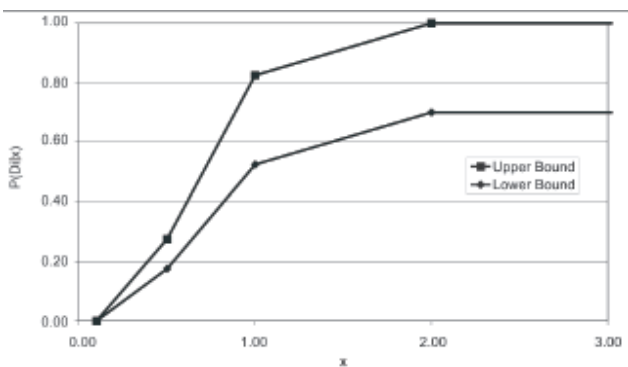


Figure 2.6

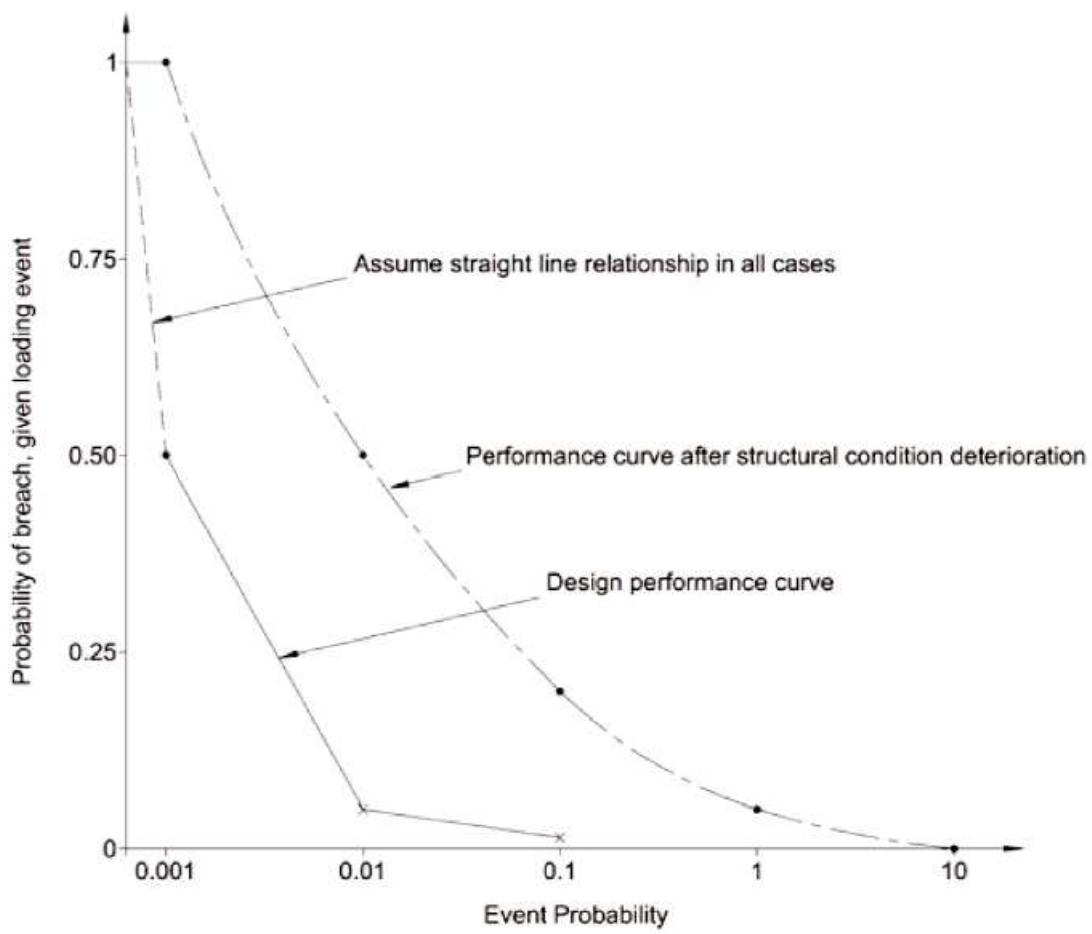


Figure 2.7

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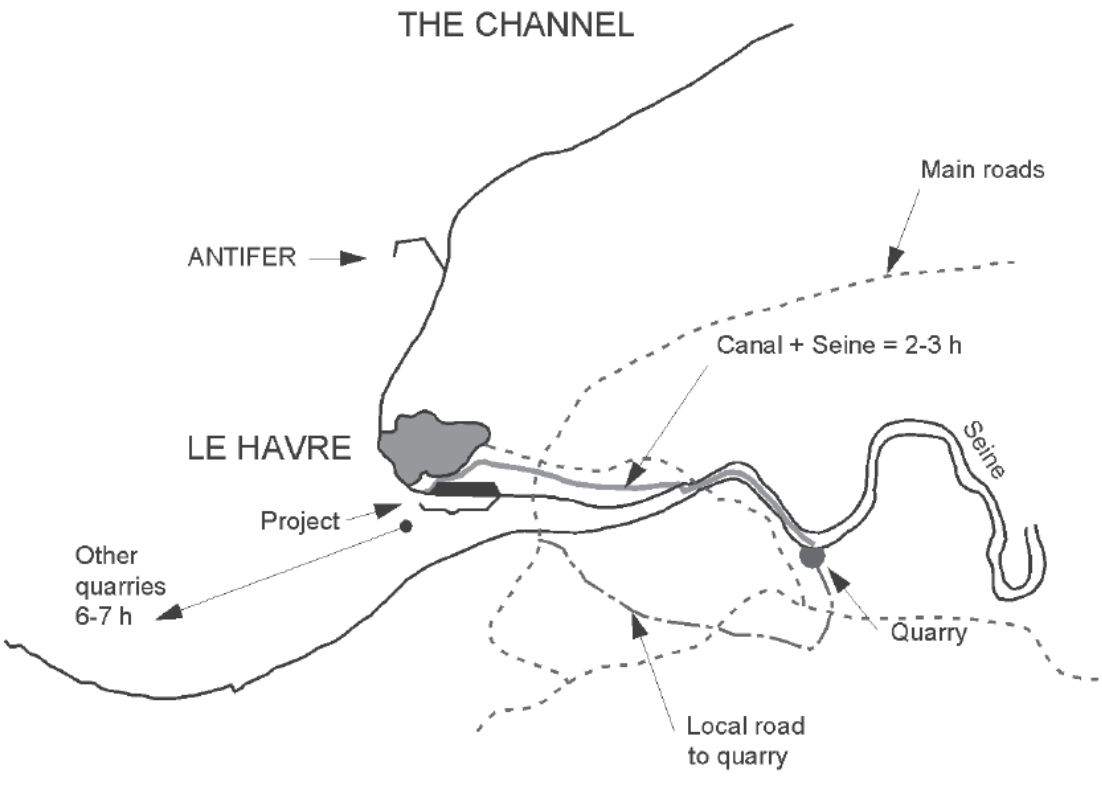


Figure 3.6

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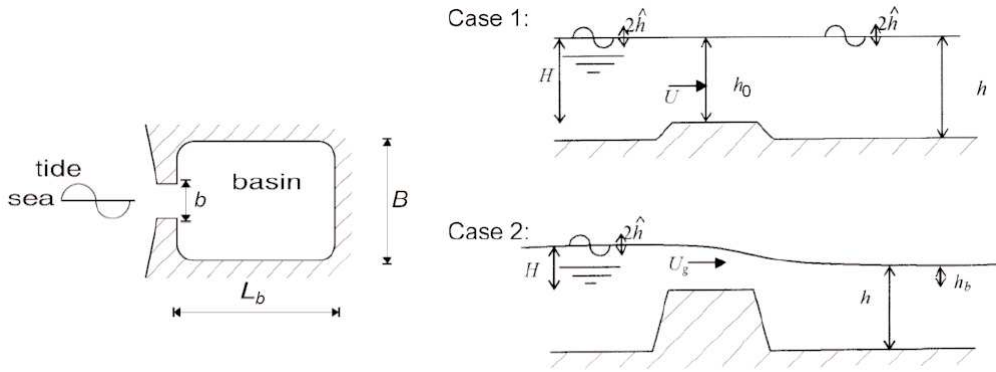


Figure 4.18

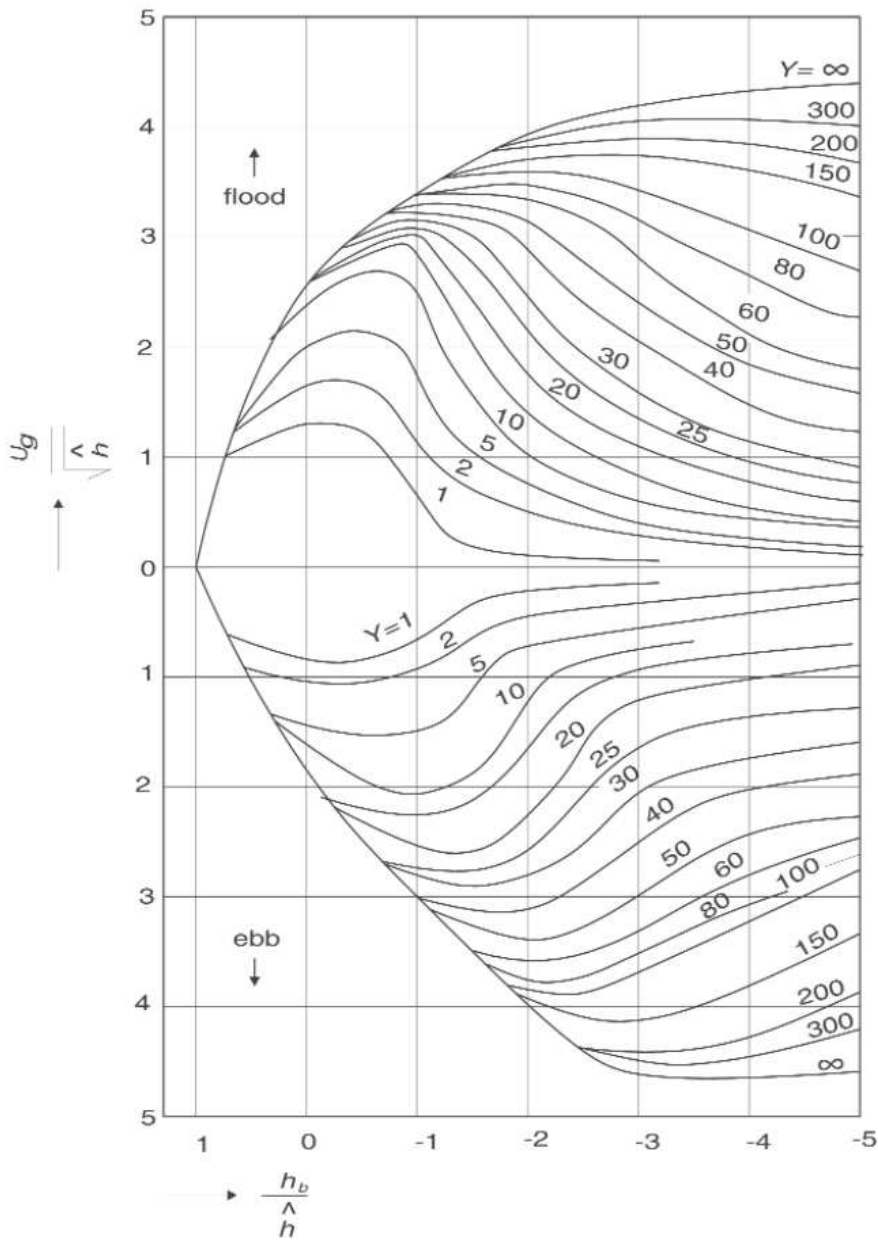


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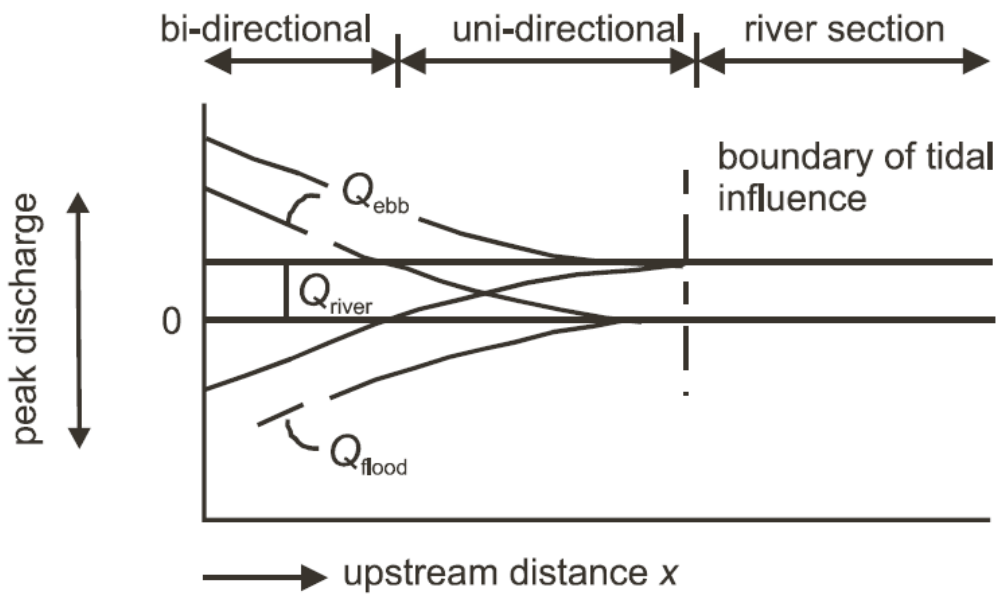


Figure 4.20

Figures from Chapter 5:

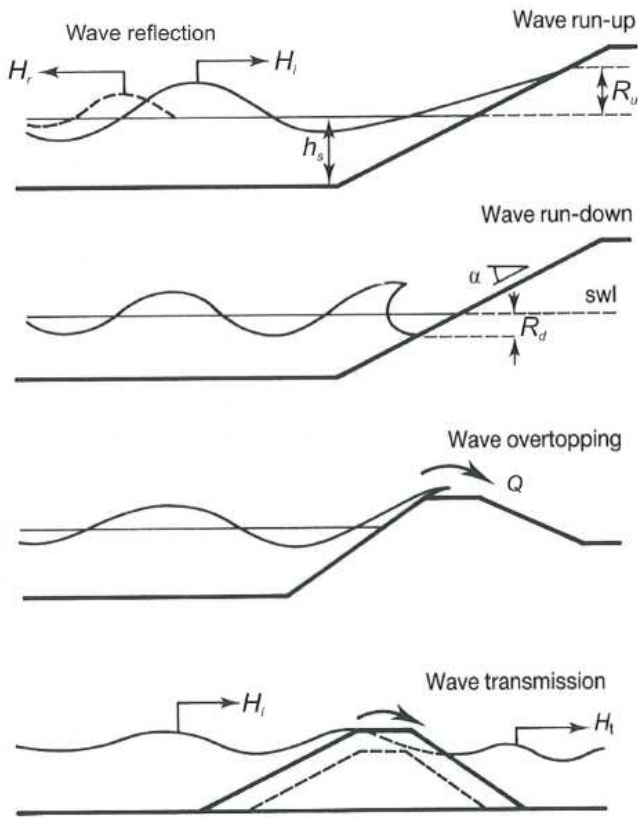


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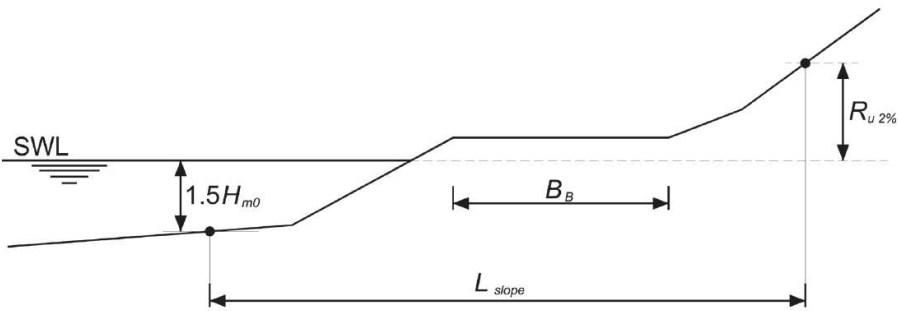


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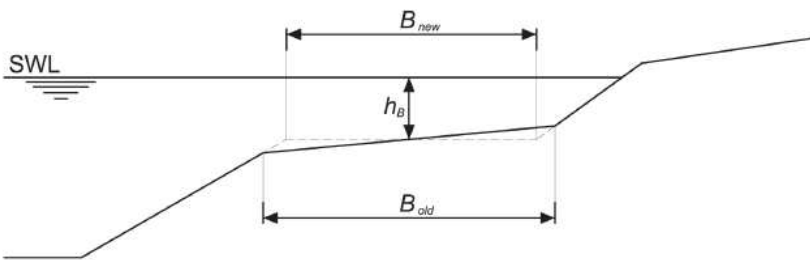


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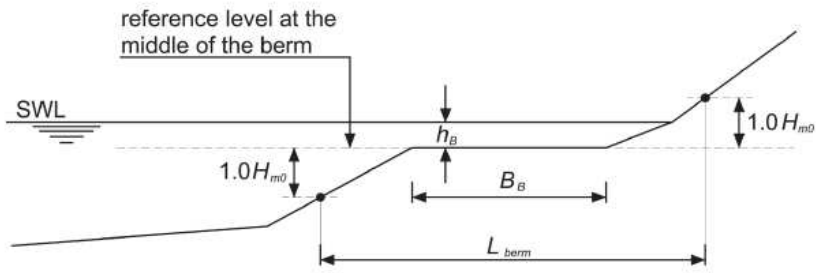


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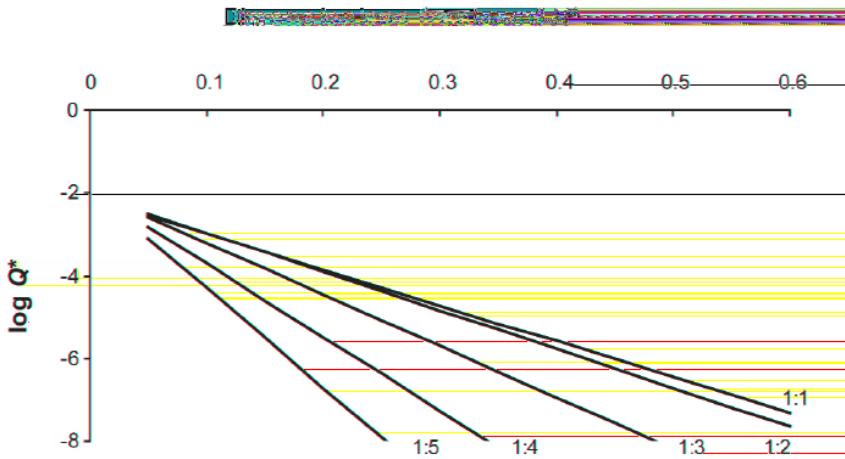


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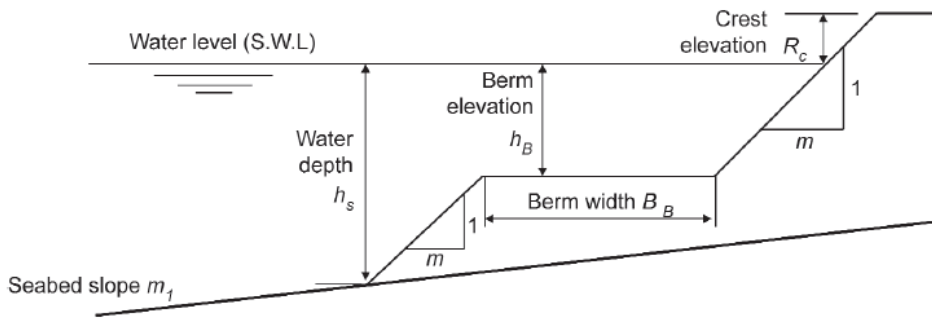


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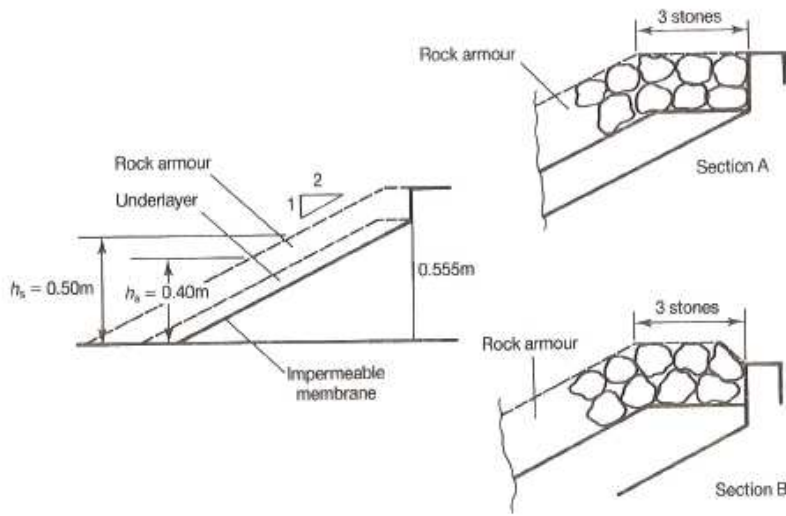


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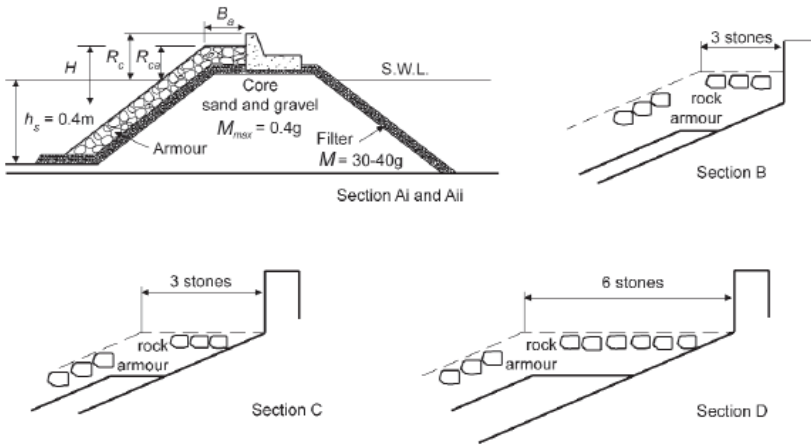


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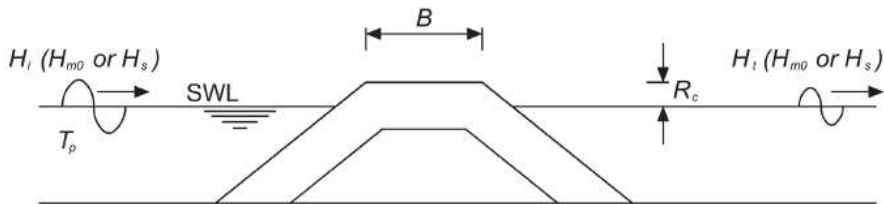


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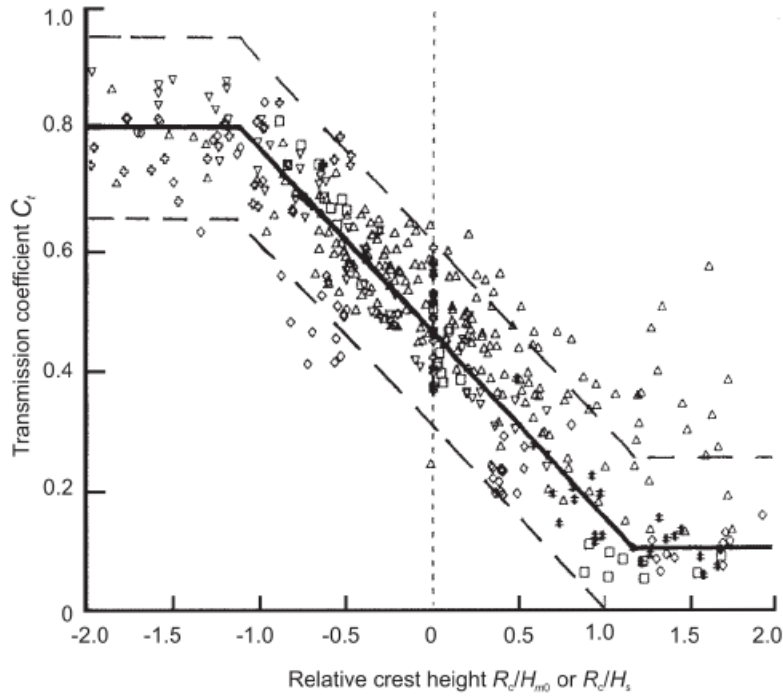


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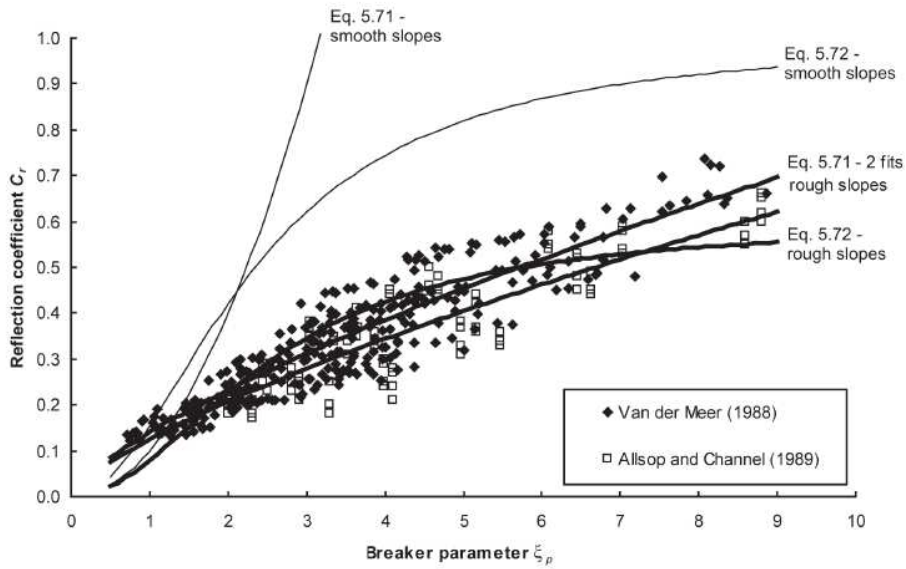


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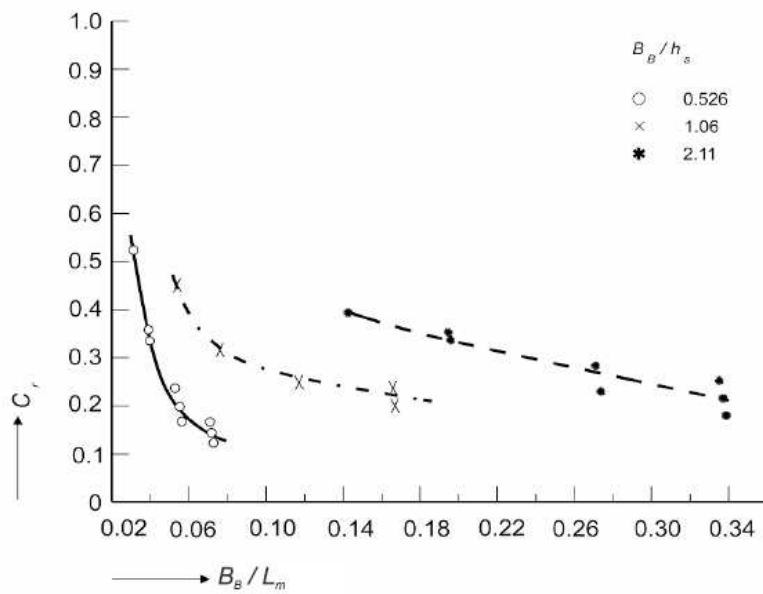
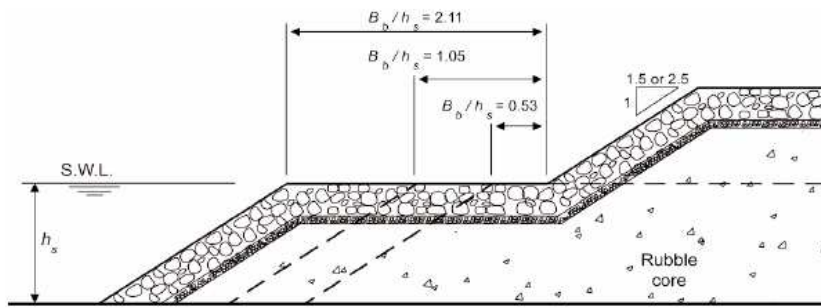
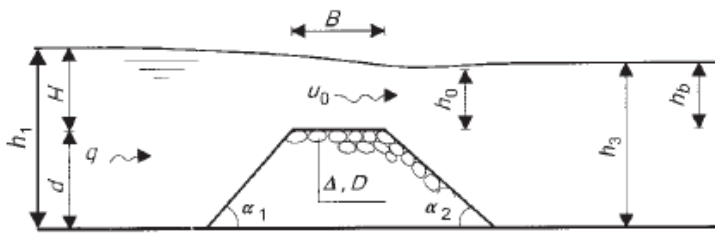


Figure 5.19

regime	flow	criterion
low dam flow		$\frac{h_b}{\Delta D} \geq 4$
intermediate flow		$-1 < \frac{h_b}{\Delta D} < 4$
high dam flow		$\frac{h_b}{\Delta D} < -1$ and $H > 0$
through flow		$H < 0$

Figure 5.20



Note:  $D$  should read  $D_{n50}$  in this figure

Figure 5.21

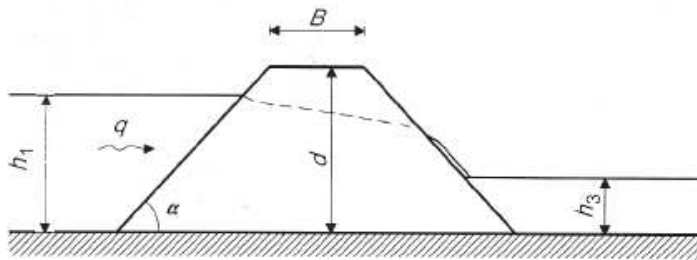
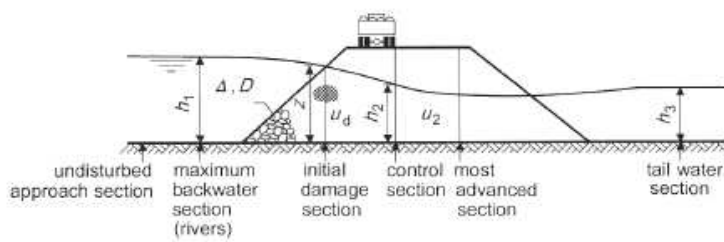
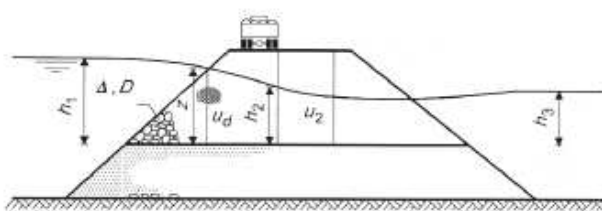


Figure 5.22



Note:  $D$  should read  $D_{n50}$  in this figure

Figure 5.23



Note:  $D$  should read  $D_{n50}$  in this figure

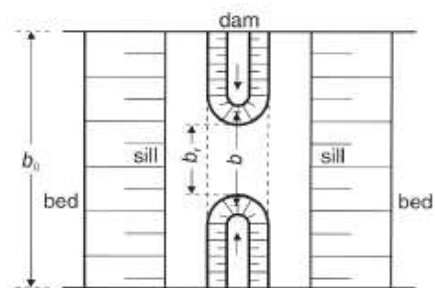


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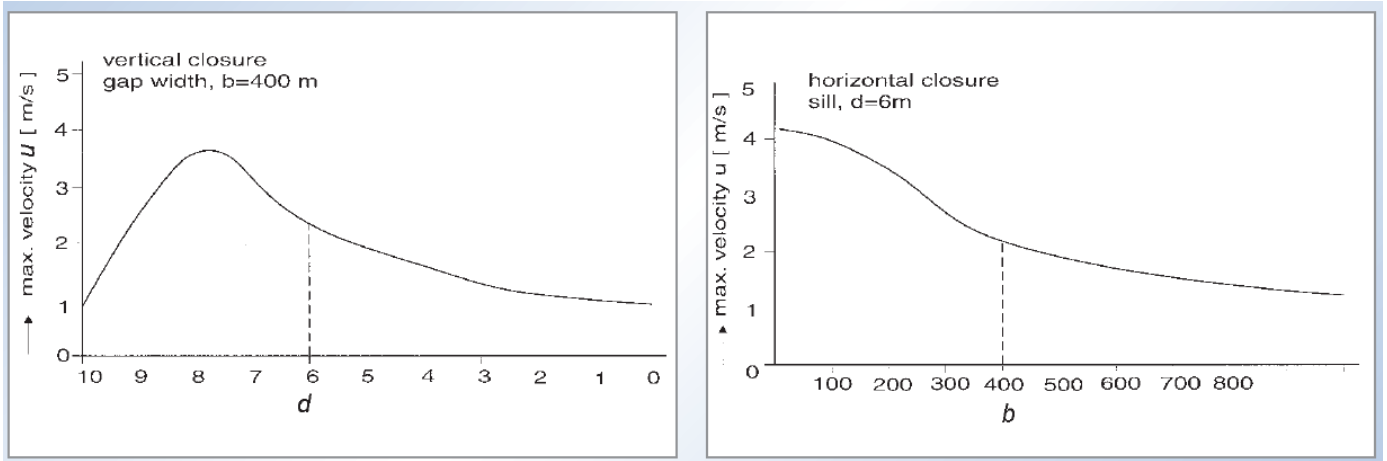


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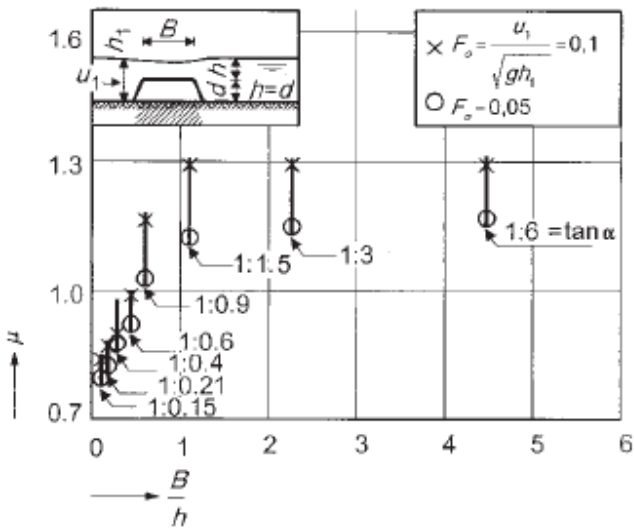


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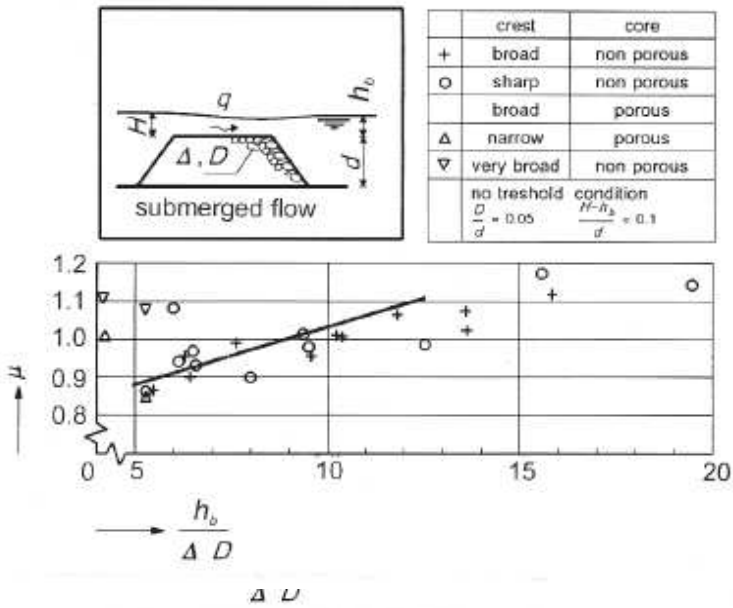
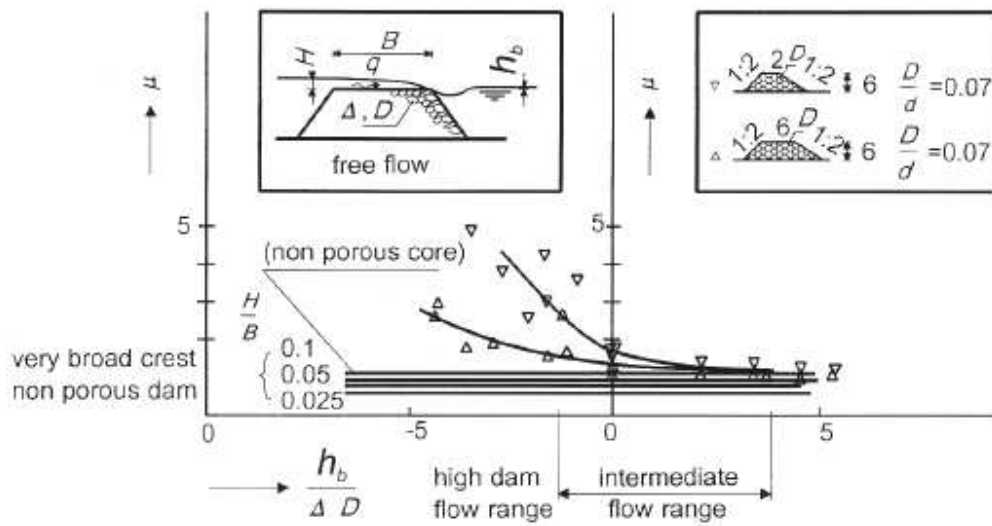


Figure 5.27  
dam and at the thre



Note:  $D$  should read  $D_{n50}$  in this figure

Figure 5.28

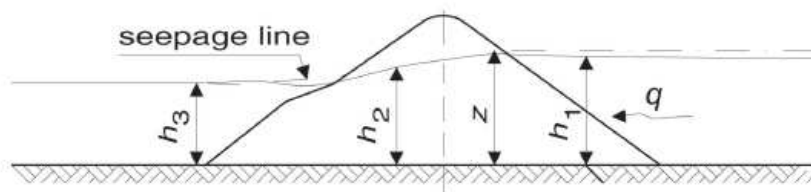
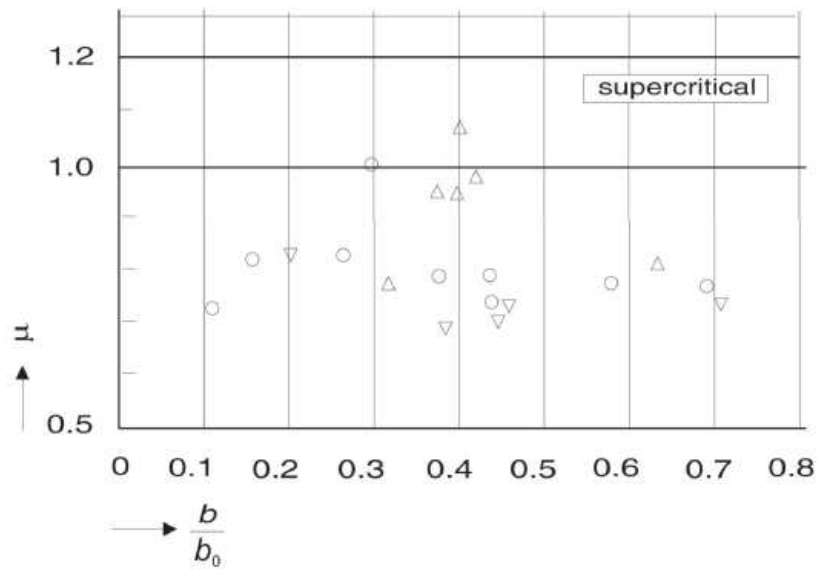
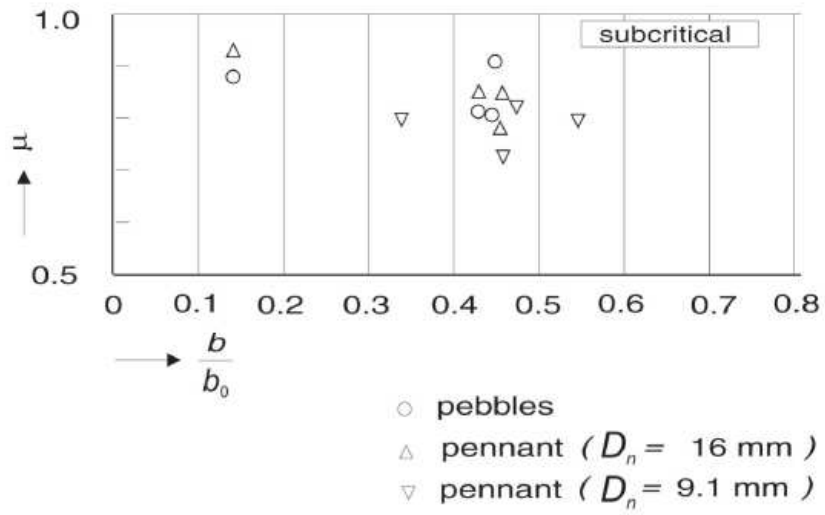


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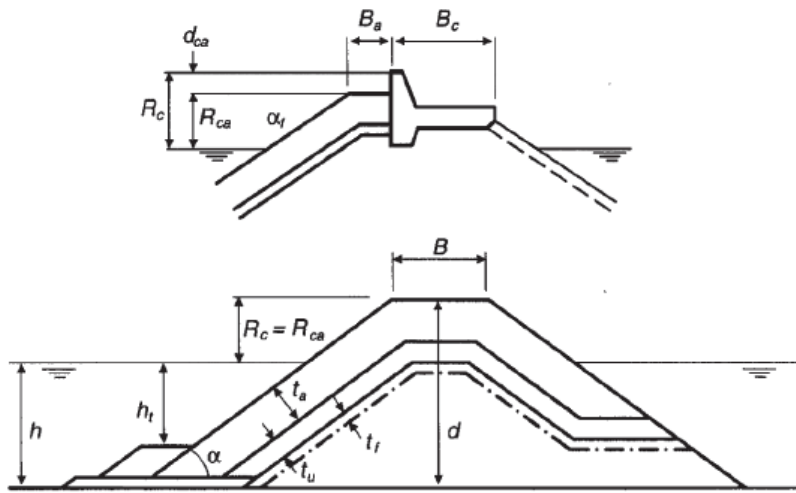


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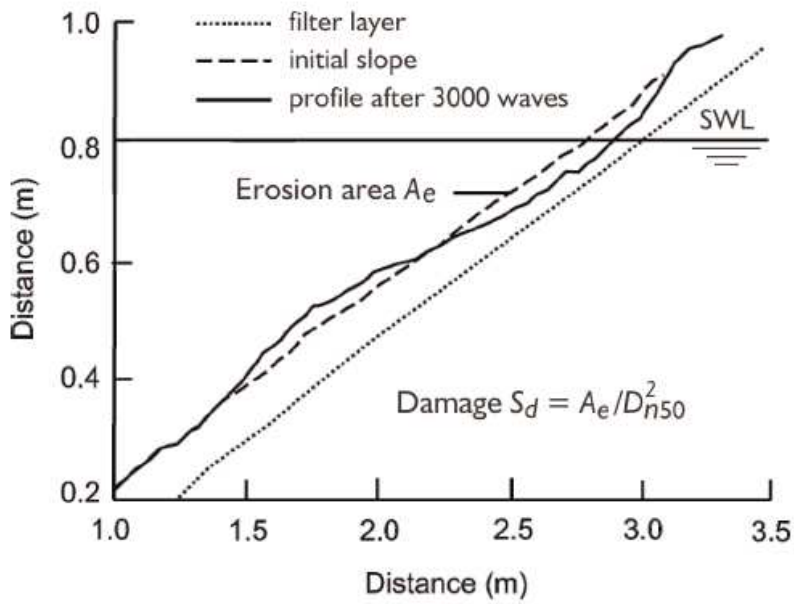


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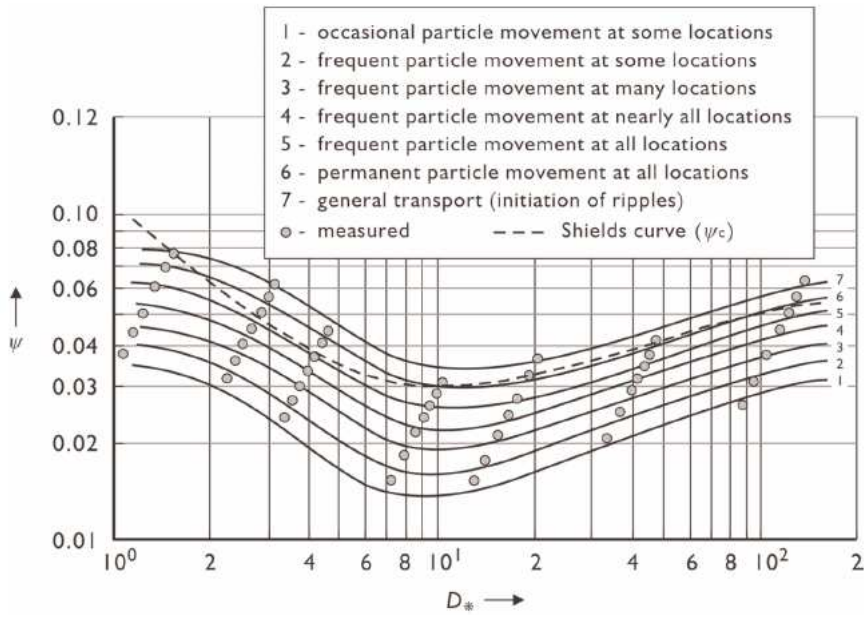


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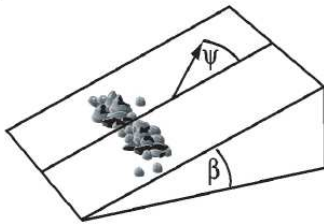
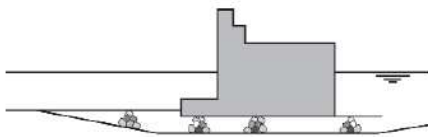
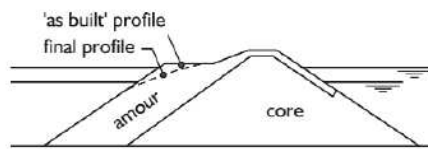


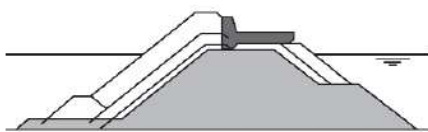
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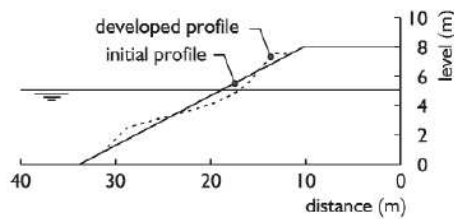
caisson  $H/\Delta D < 1$



berm breakwater  $H/\Delta D = 3 - 6$



rubble mound breakwater  $H/\Delta D = 1 - 4$



dynamic rock slope  $H/\Delta D = 6 - 20$

Figure 5.36

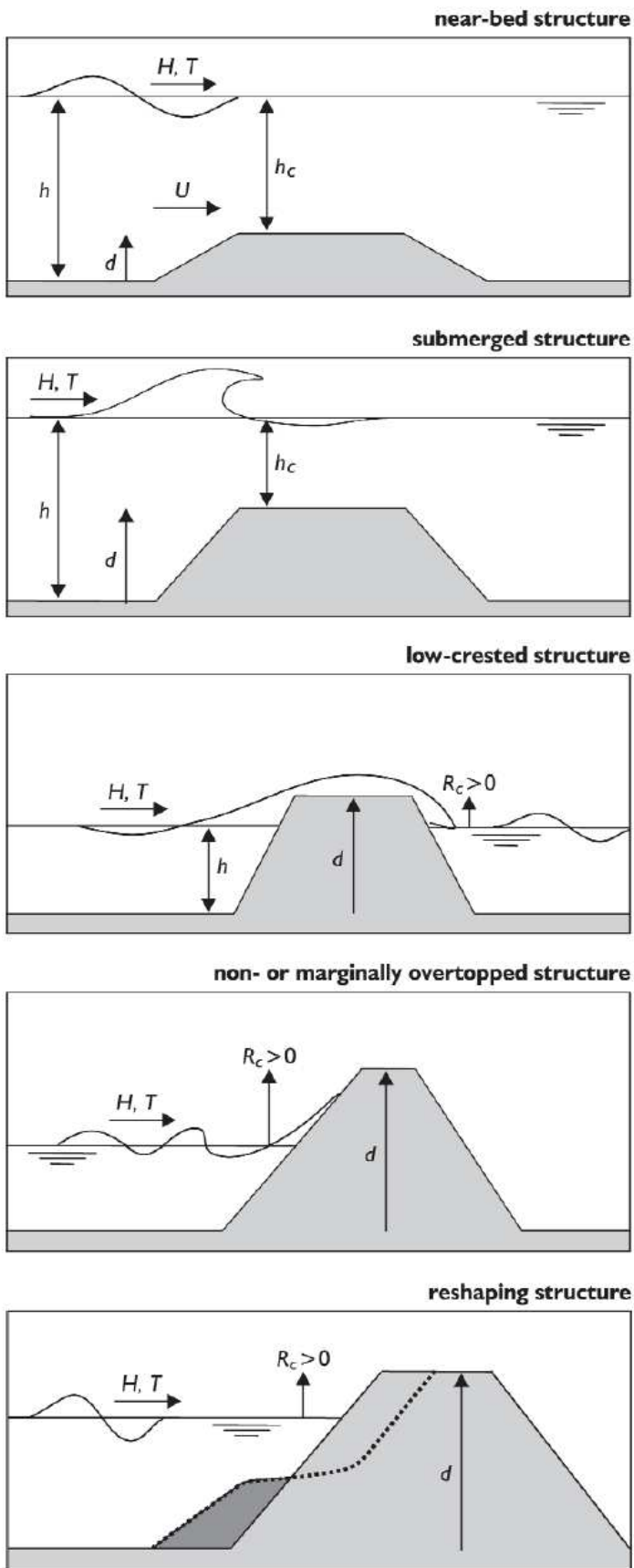


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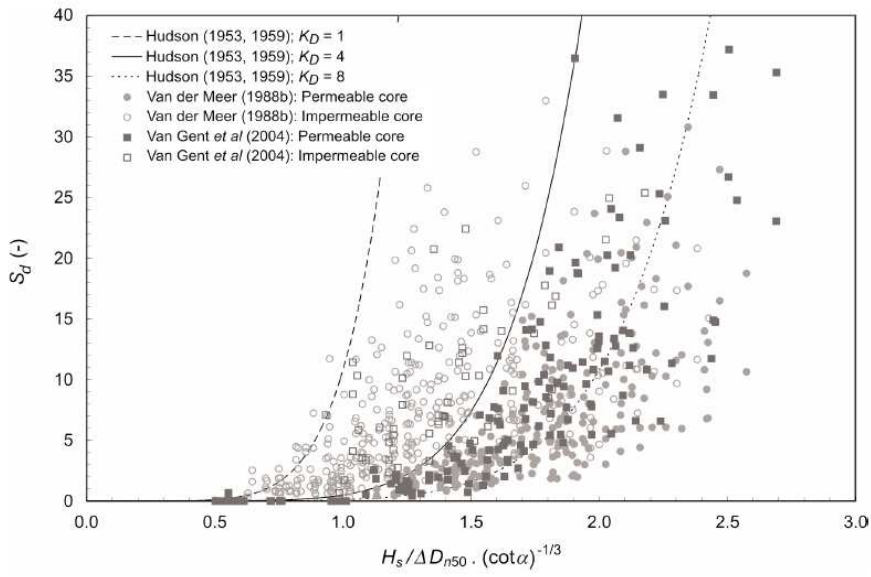
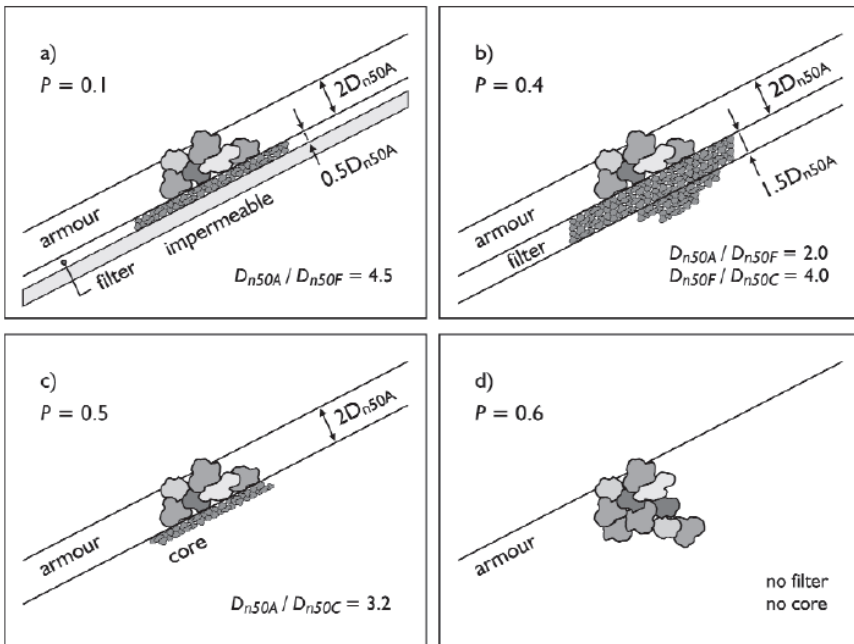


Figure 5.38



$D_{n50A}$  = nominal diameter of armour stone  
 $D_{n50F}$  = nominal diameter of filter material  
 $D_{n50C}$  = nominal diameter of core

Figure 5.39

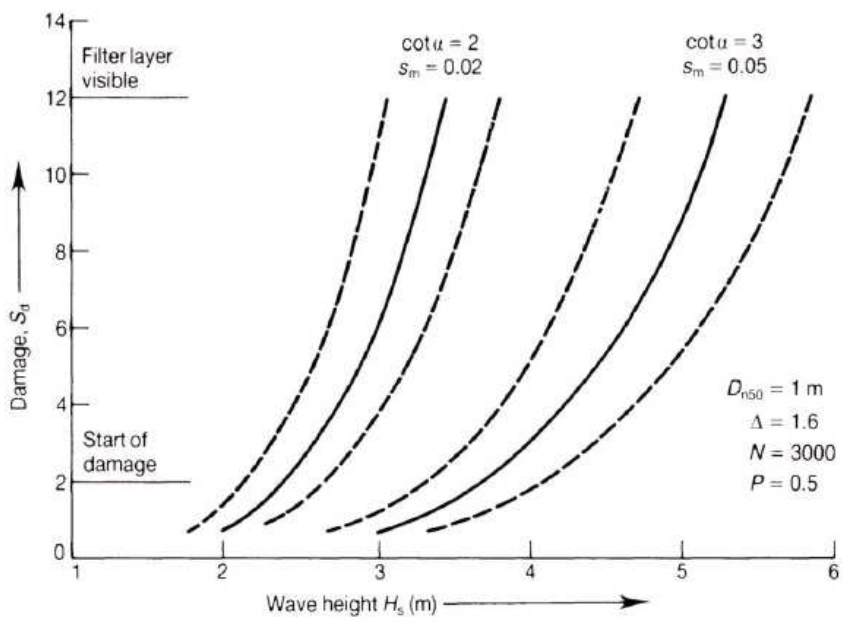


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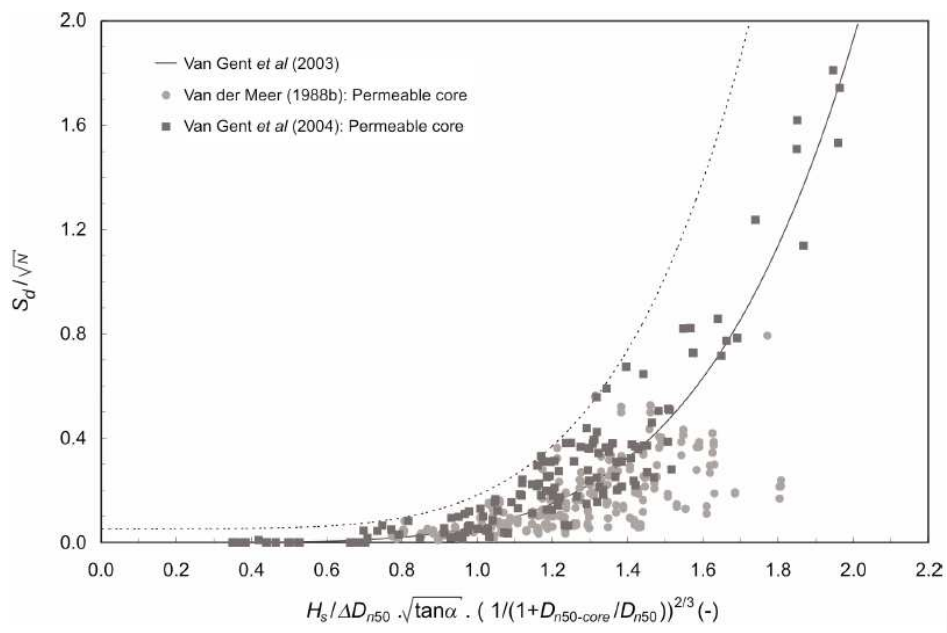


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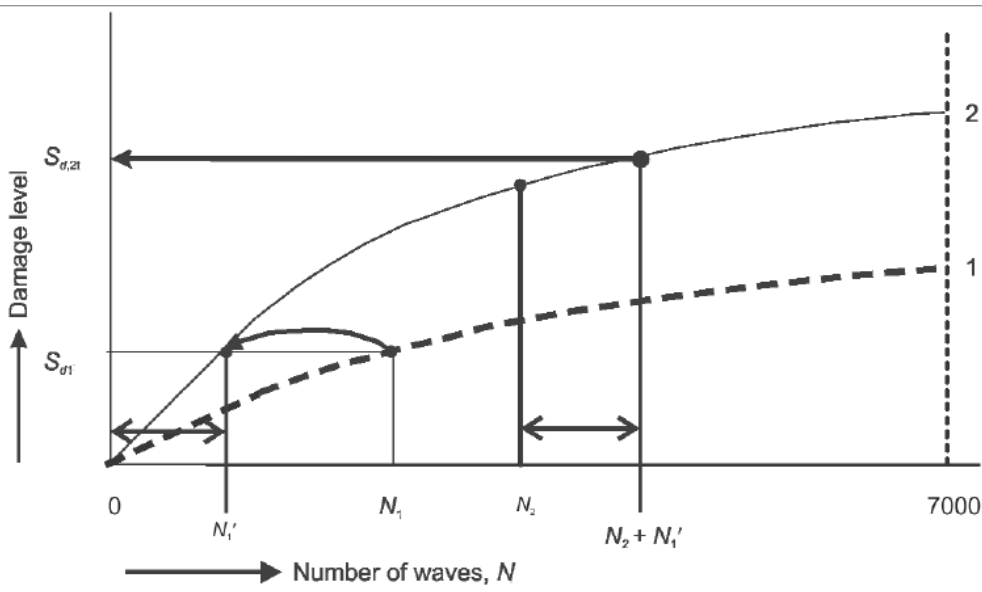


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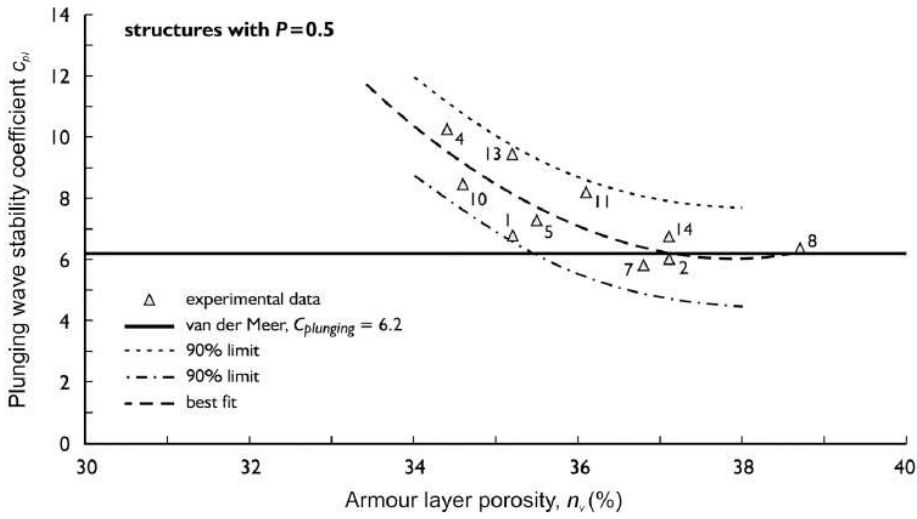


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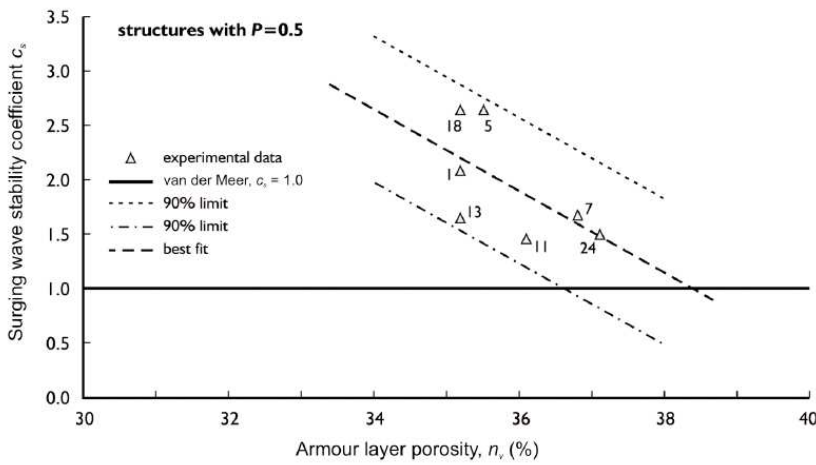


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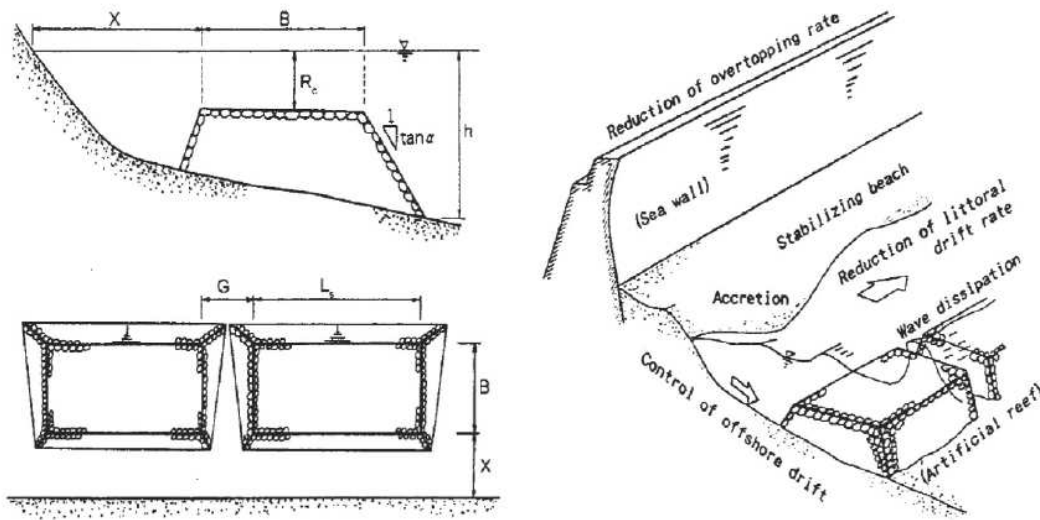


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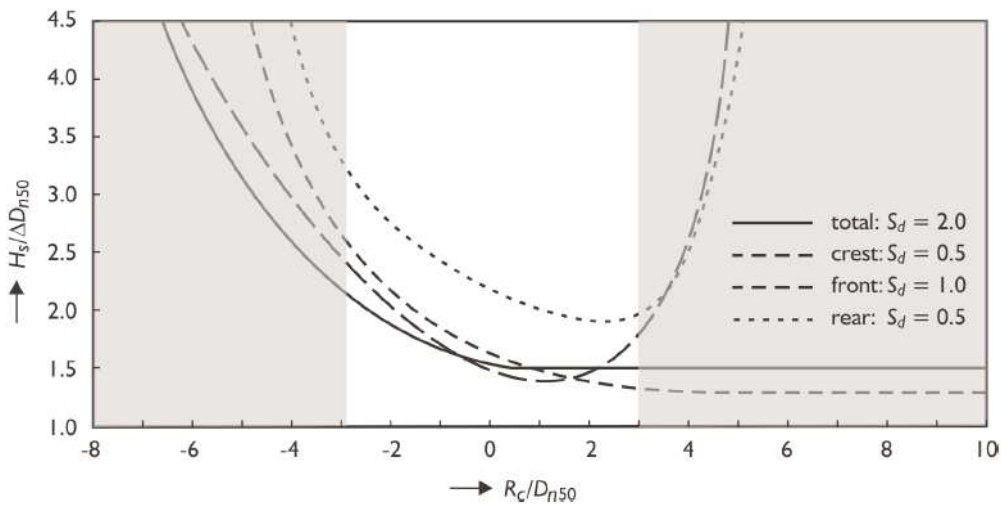


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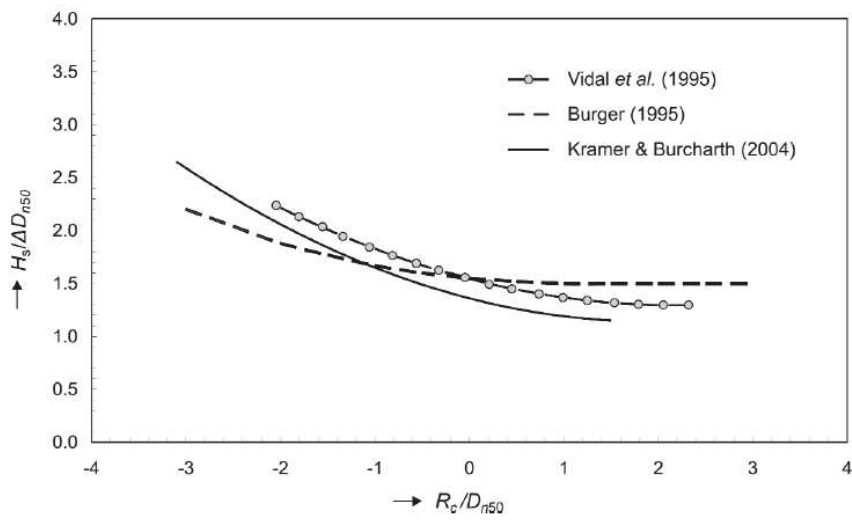


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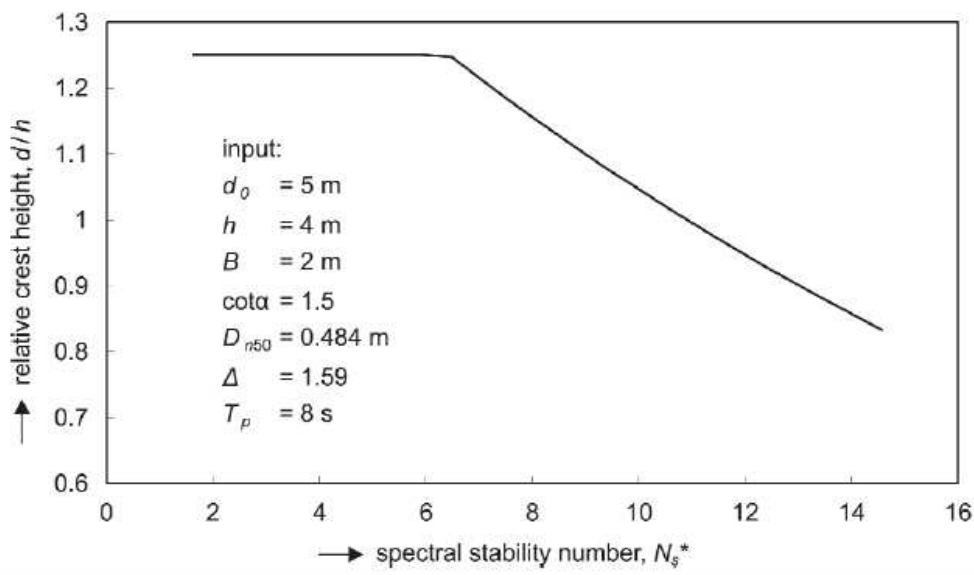


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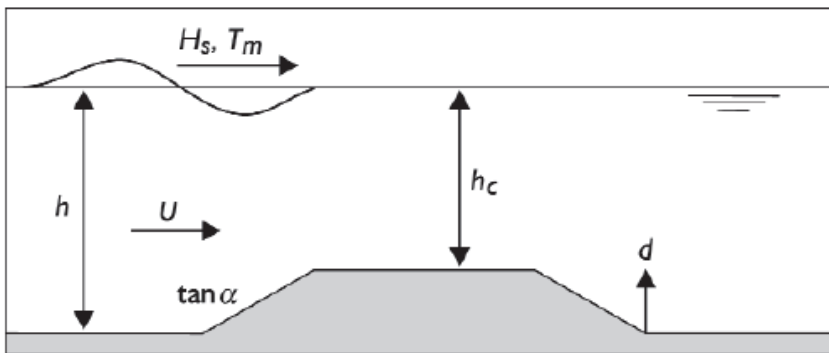


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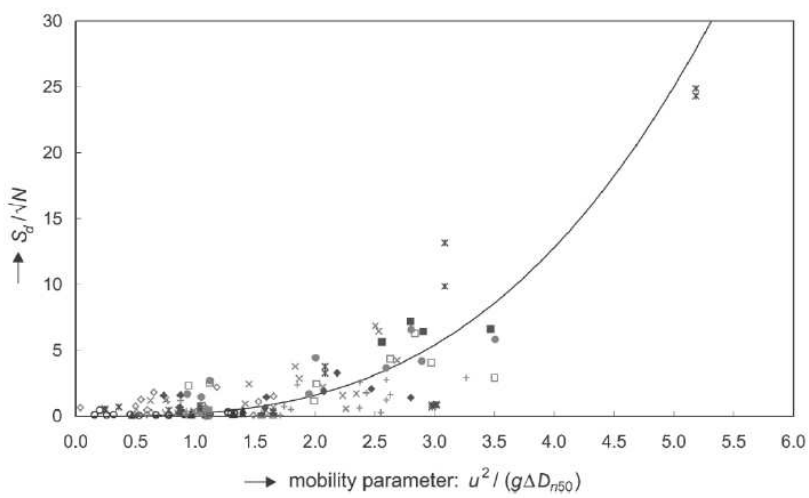


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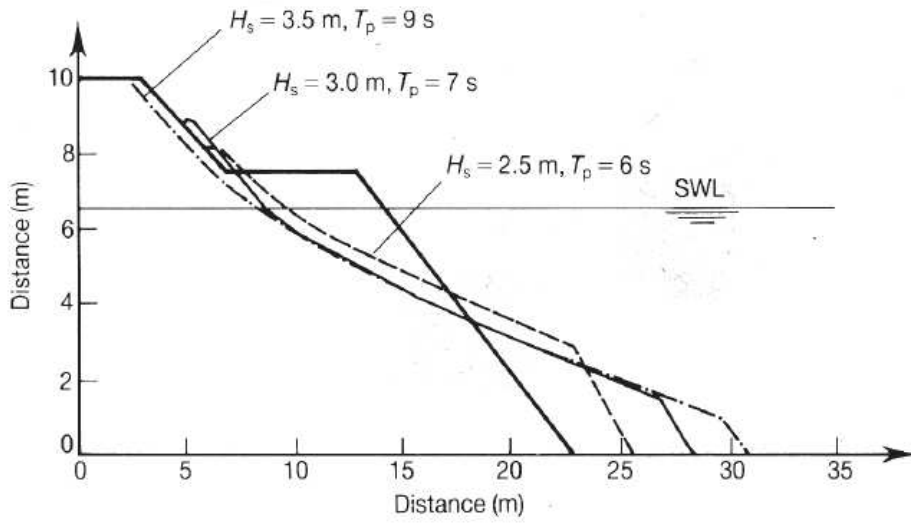


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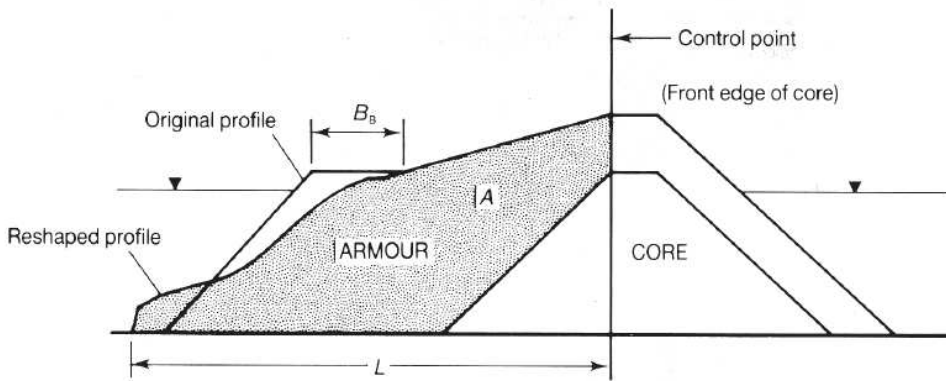


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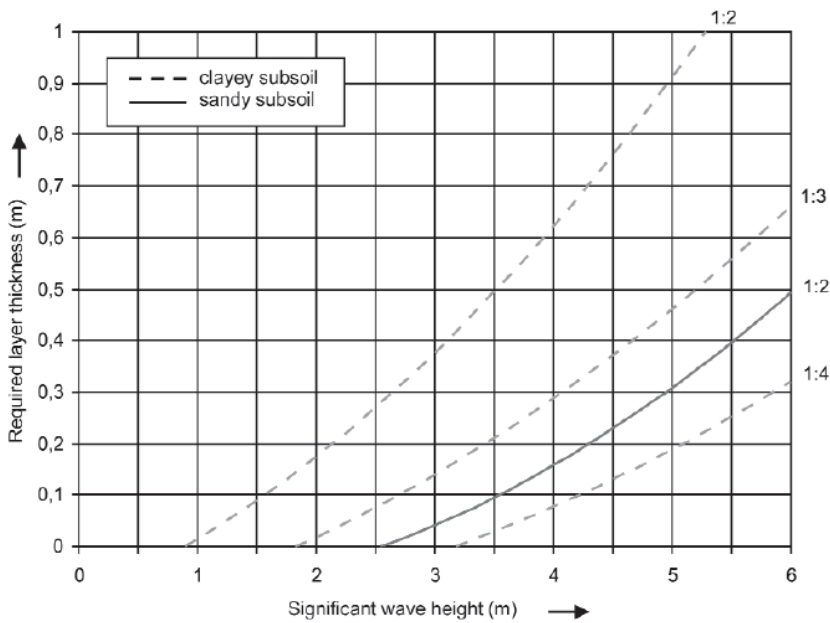


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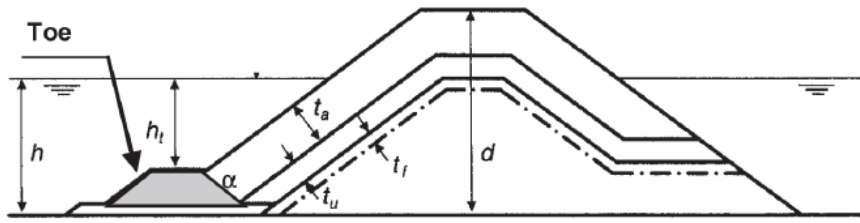


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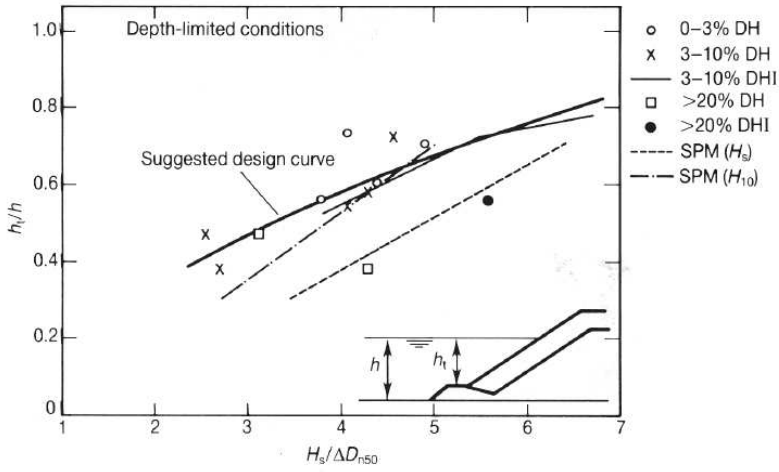


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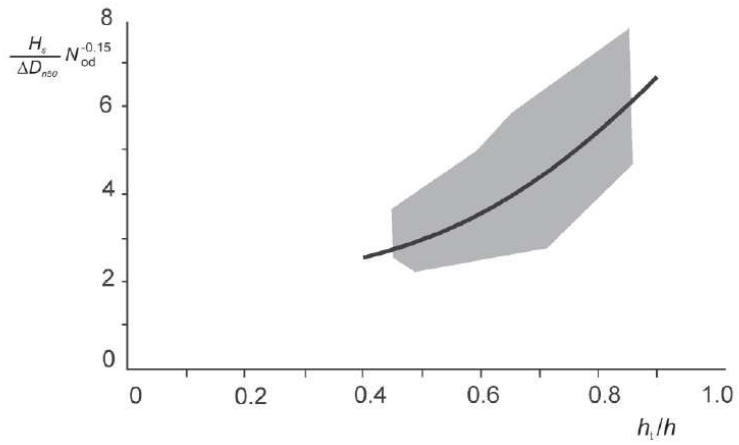
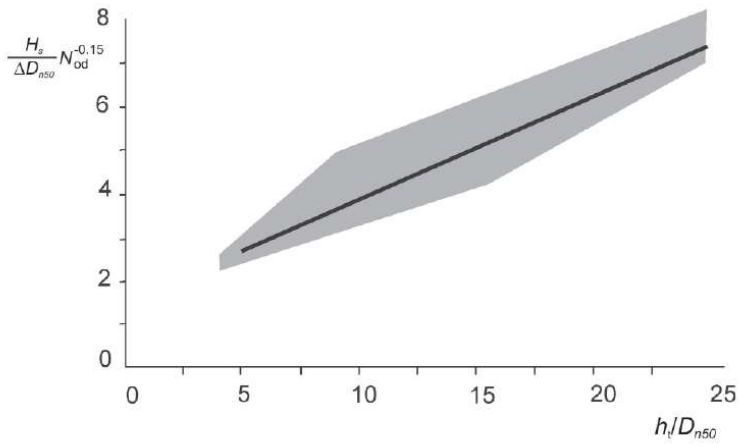


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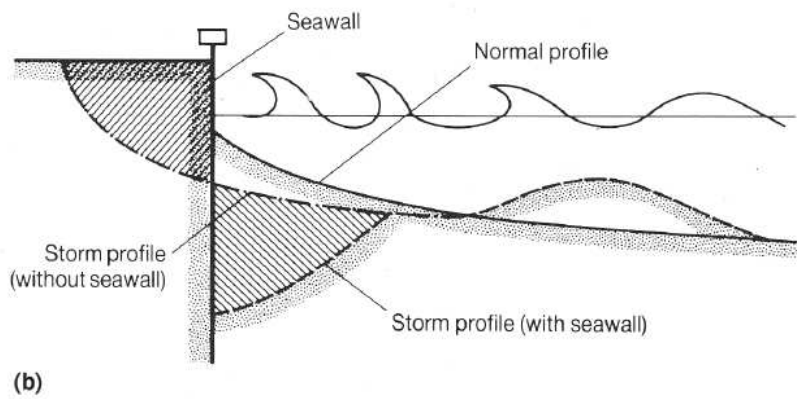
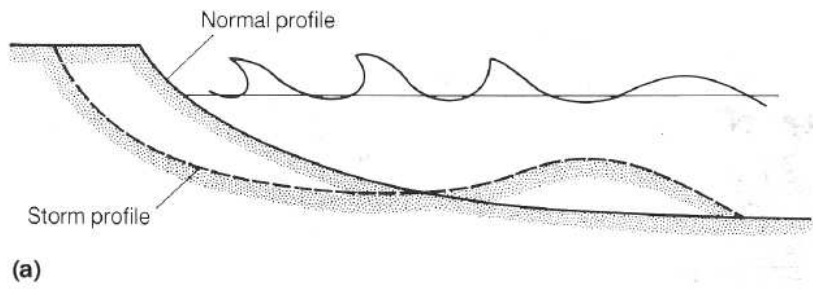


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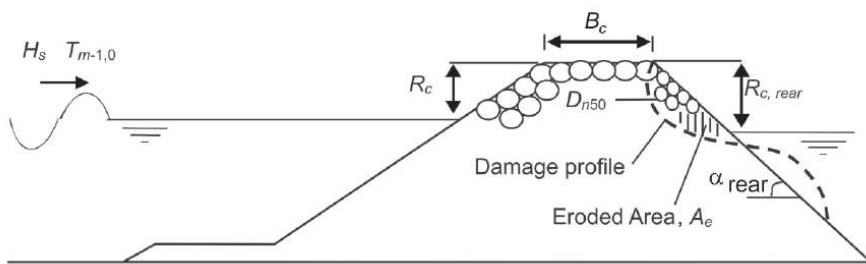


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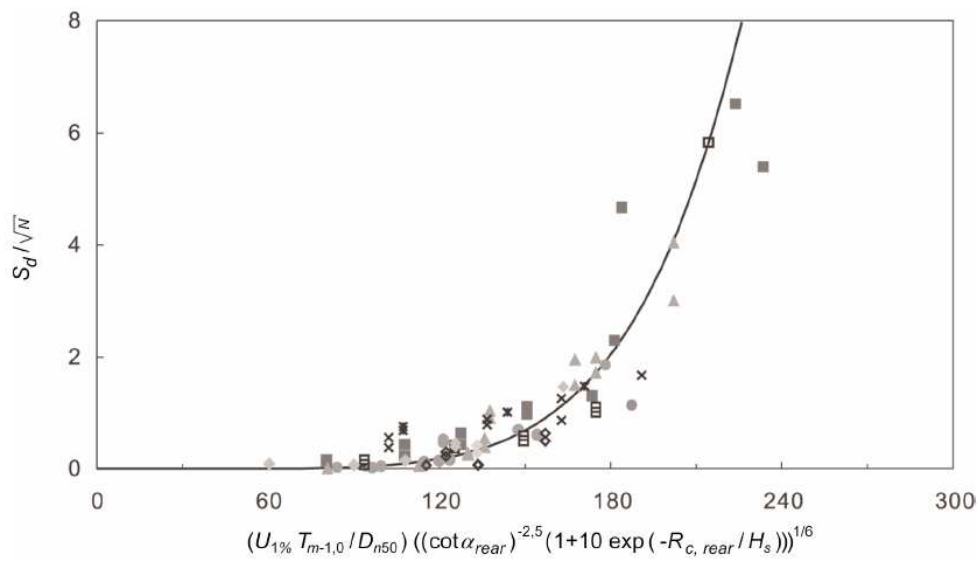


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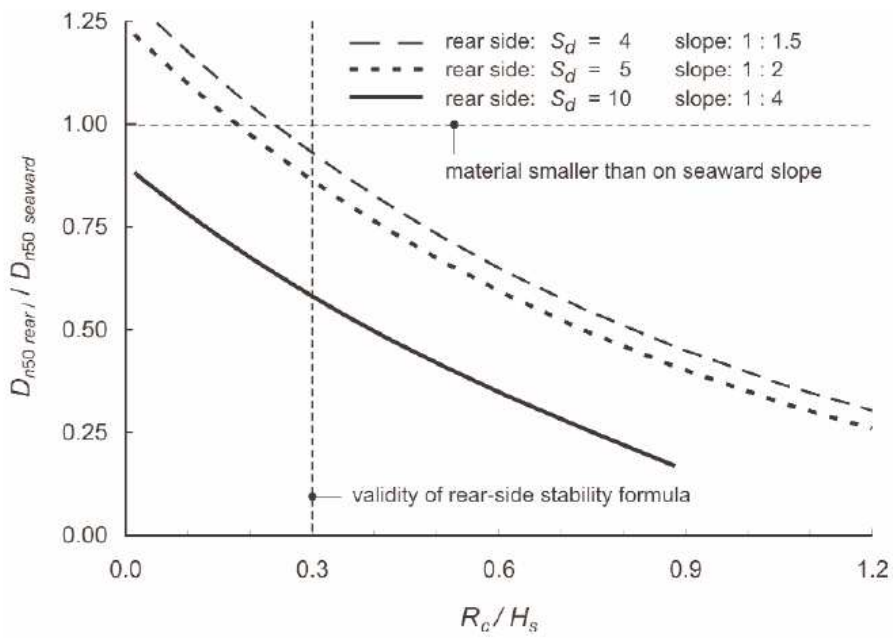


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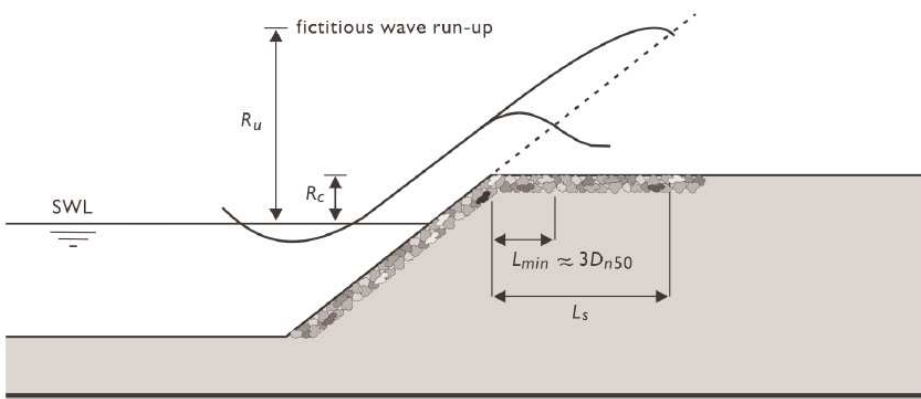


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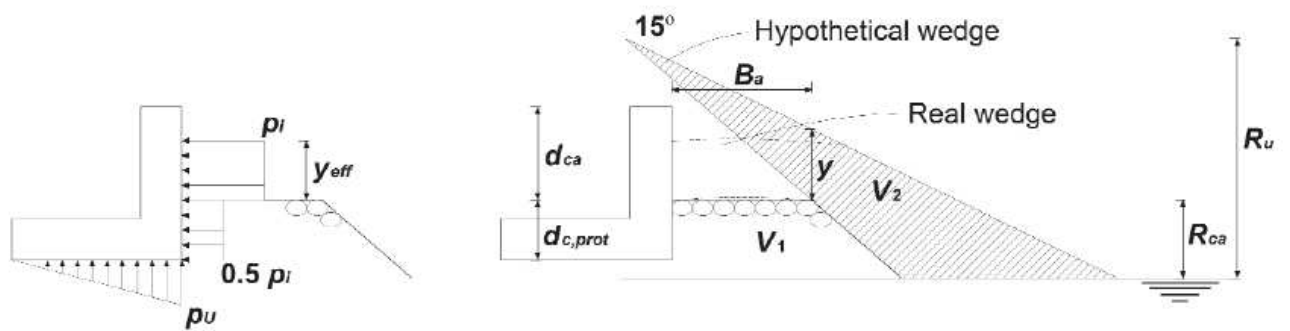


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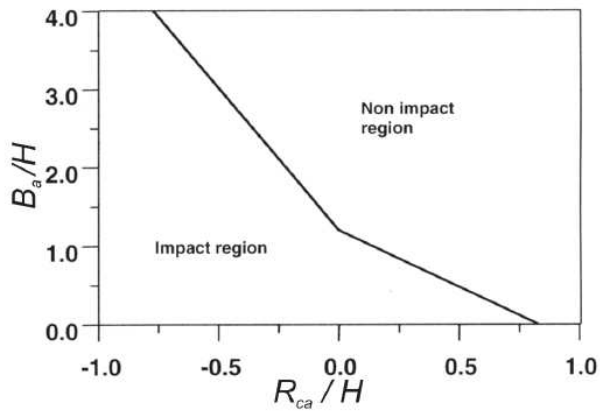


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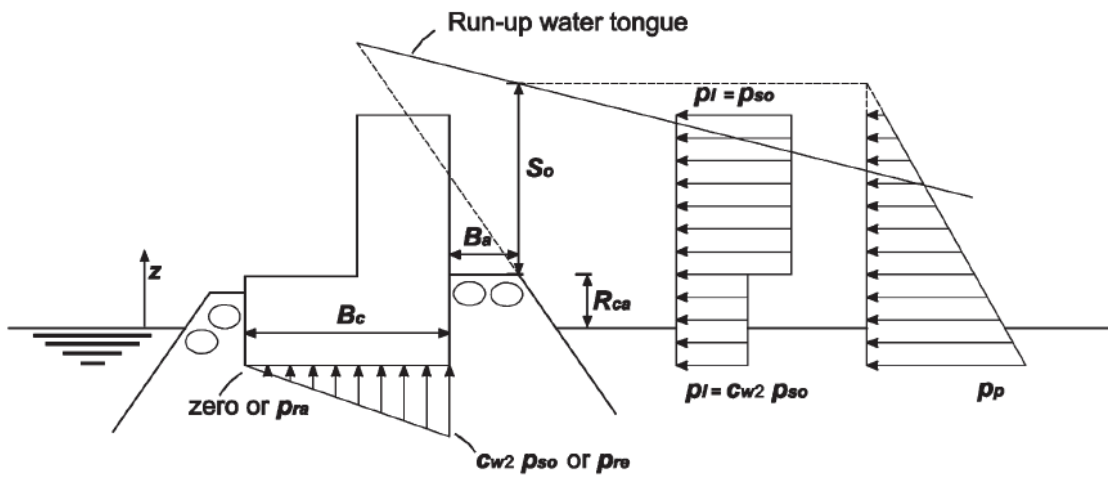


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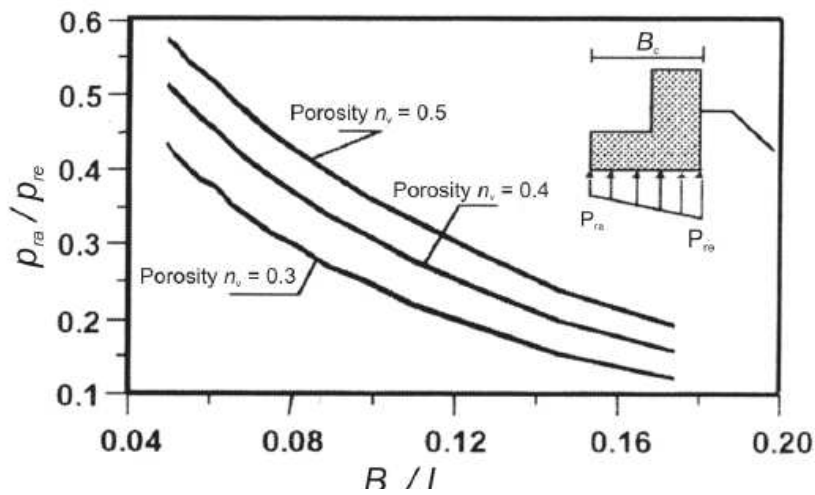
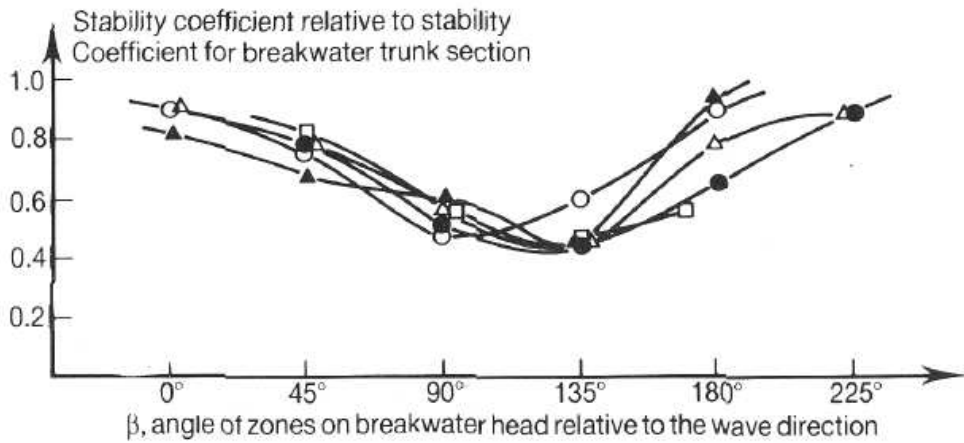


Figure 5.87



Legend  
Wave direction  $\alpha$

- 50°
- △ 70°
- 90°
- ▲ 110°
- 130°

Note  
Slope 1 : 1.33  
Wave steepness  $s_{0D} \approx 0.035$

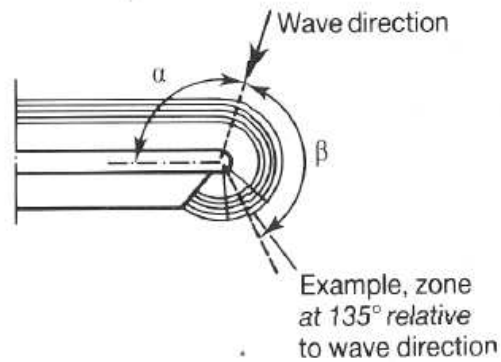
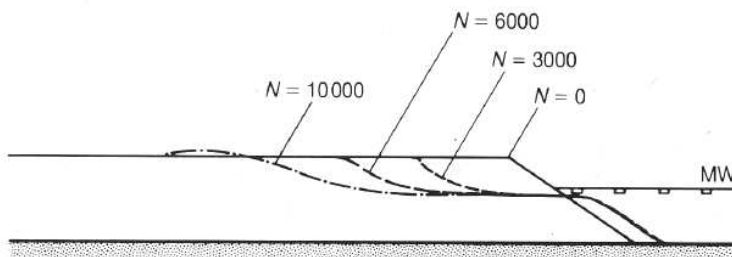


Figure 5.88



$H_s = 0.15$  m,  $T_p = 2.5$  s

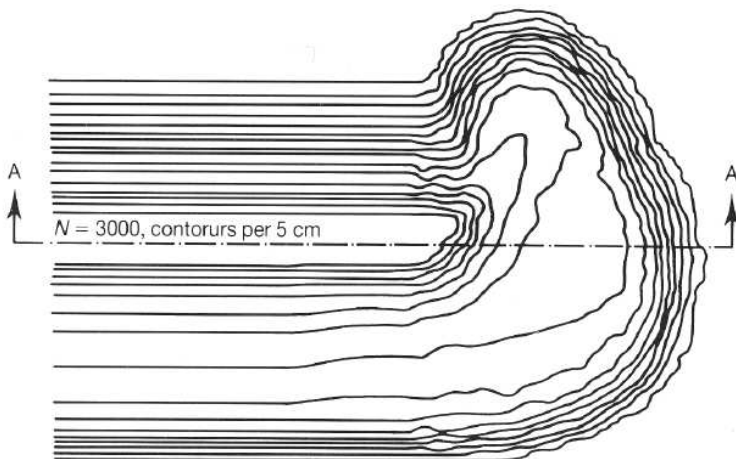


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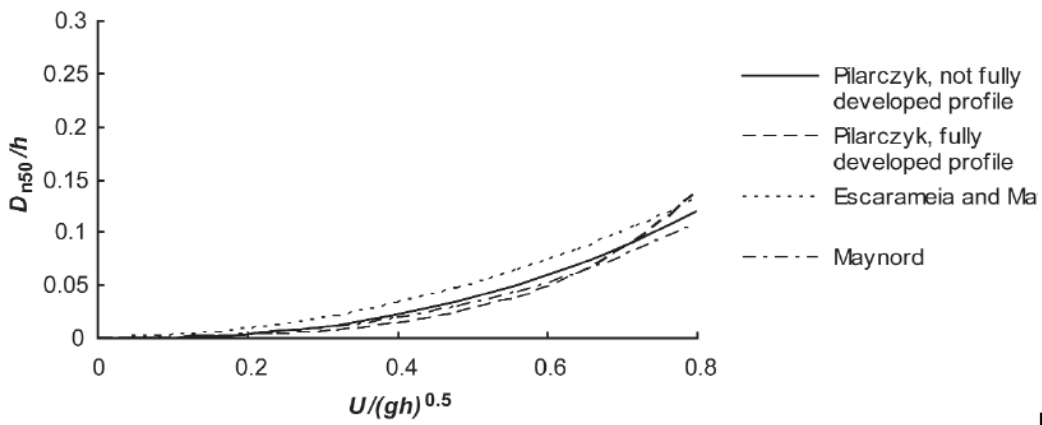


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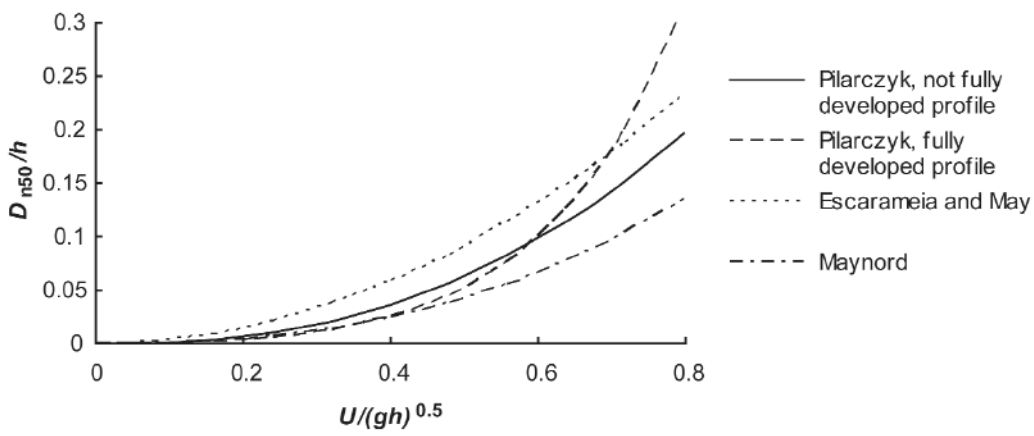


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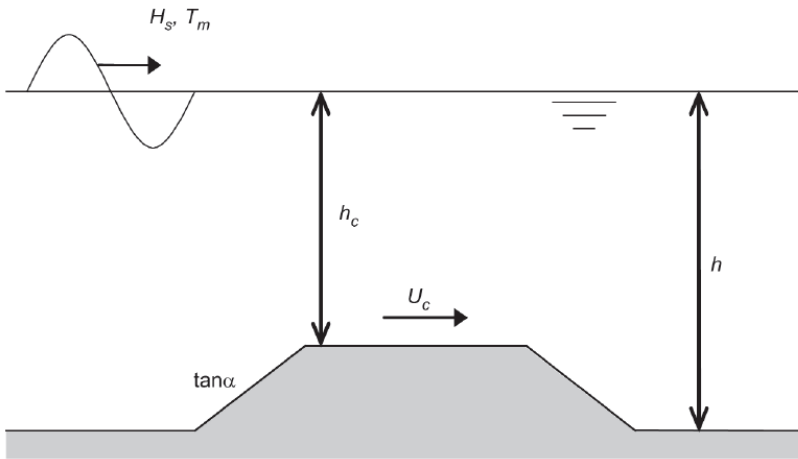


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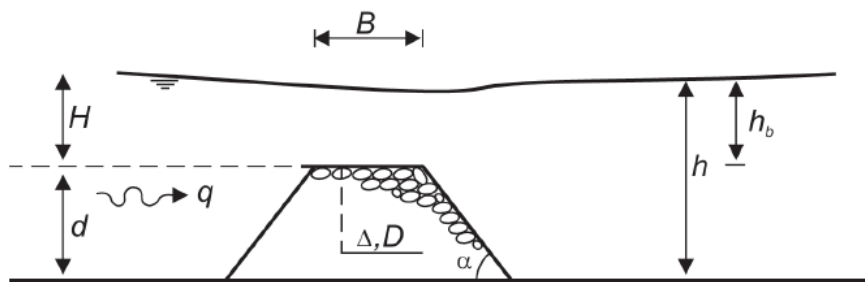


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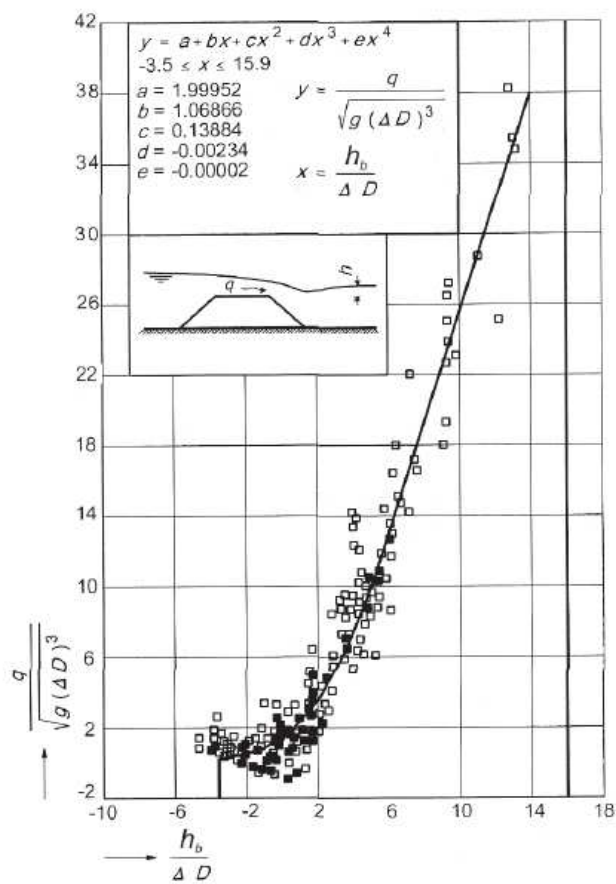
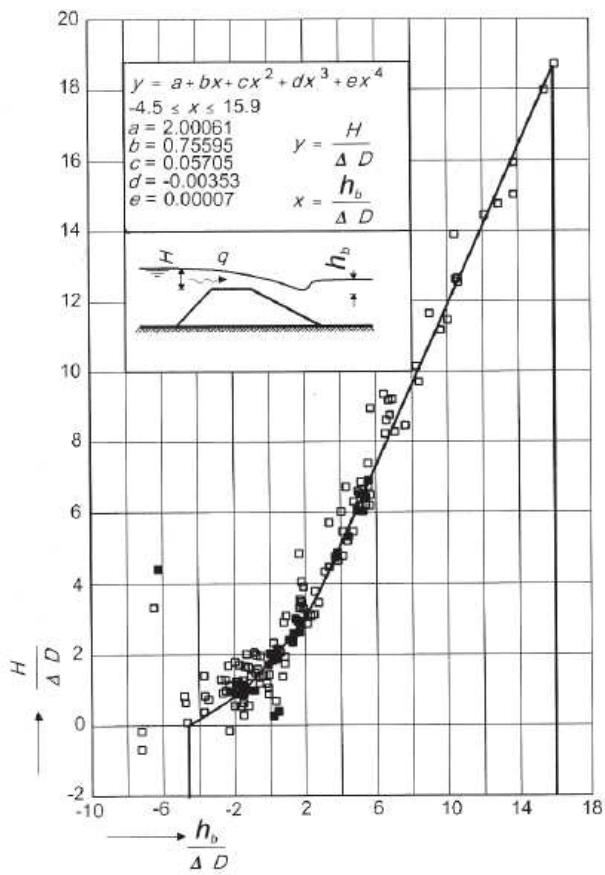


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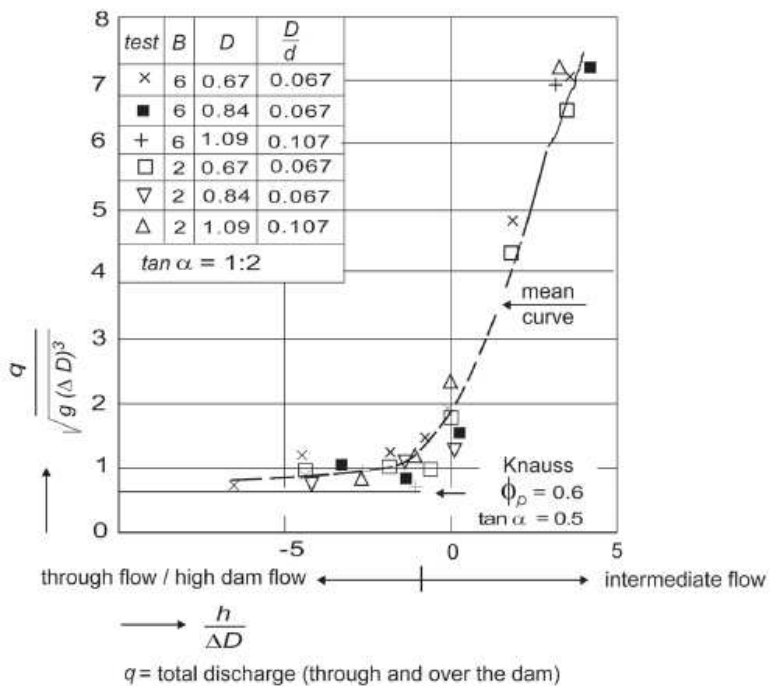


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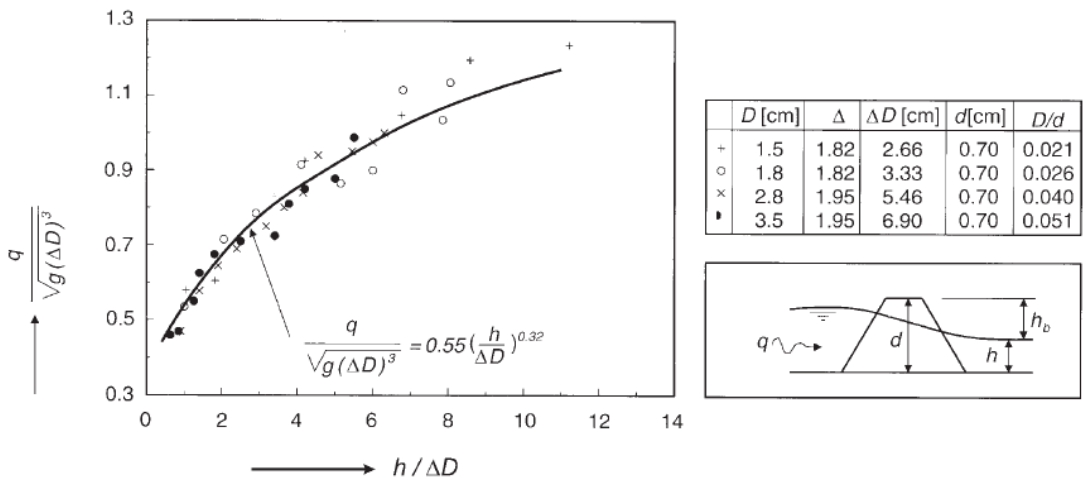


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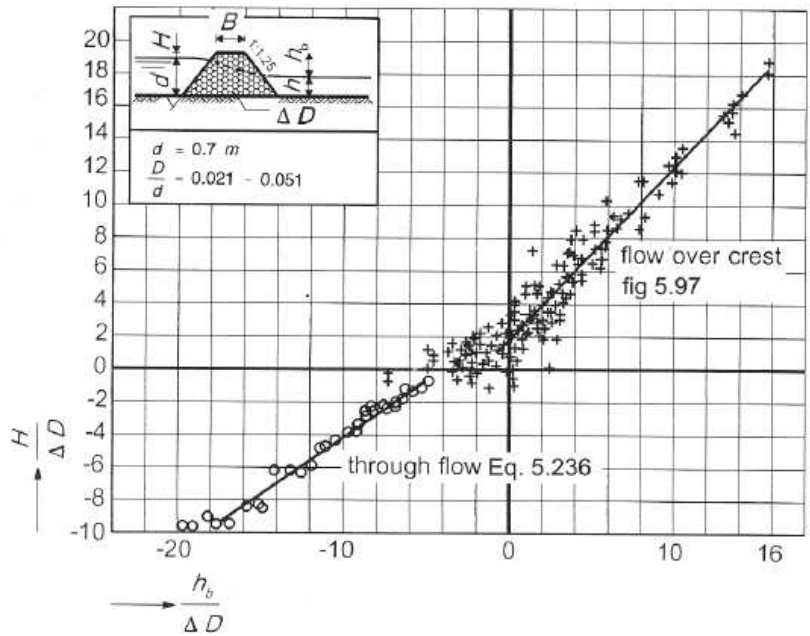


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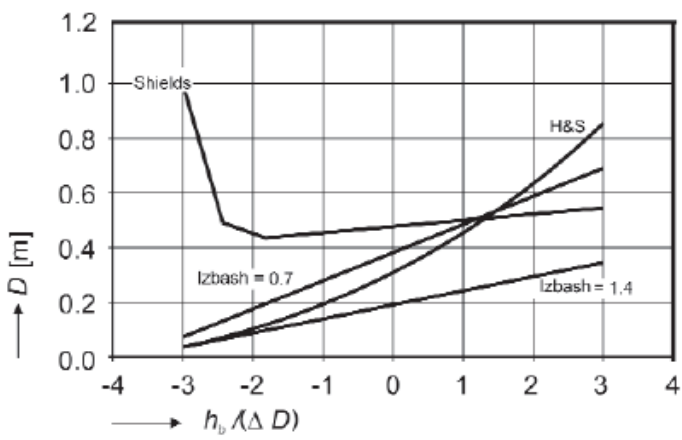
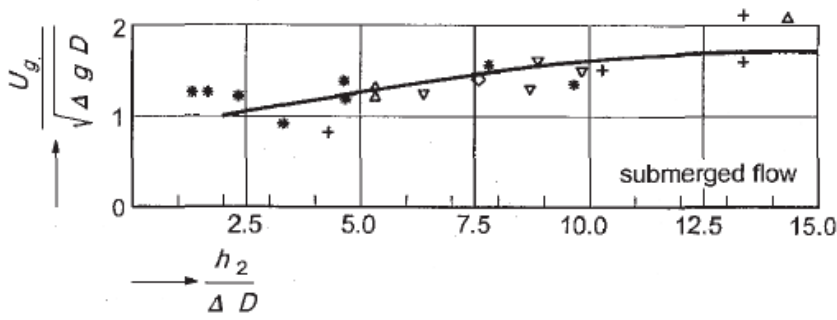
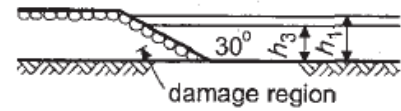


Figure 5.103





	stone dimension $\Delta D$ (m)
+ pebbles	0.0251
$\Delta$ pennant Naylor	0.0175
$\nabla$ pennant	0.0108
* Das	0.0111
	0.0294
$\square$ Shire river	0.9700
$\diamond$ Mangla Dam	0.6300
pretipped dams (stones dumped at still water)	



$$\frac{U_g}{\sqrt{\Delta g D}} = \log \left( \frac{3h_3}{D} \right) \text{ when } \Delta = 1.65$$

$h_1$  = upstream water depth  
 $h_3$  = downstream water depth  
 $h_{con}$  = control water depth

$$U_g = \frac{Q}{bz}, \quad z = \frac{(2h_1 + h_2)}{3}$$

$h_2 = h_3$  for submerged flow  
 $h_2 = h_{con}$  for supercritical flow

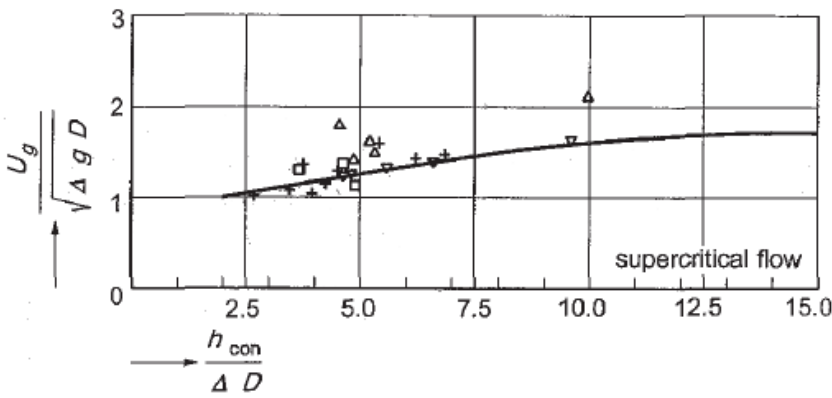


Figure 5.106

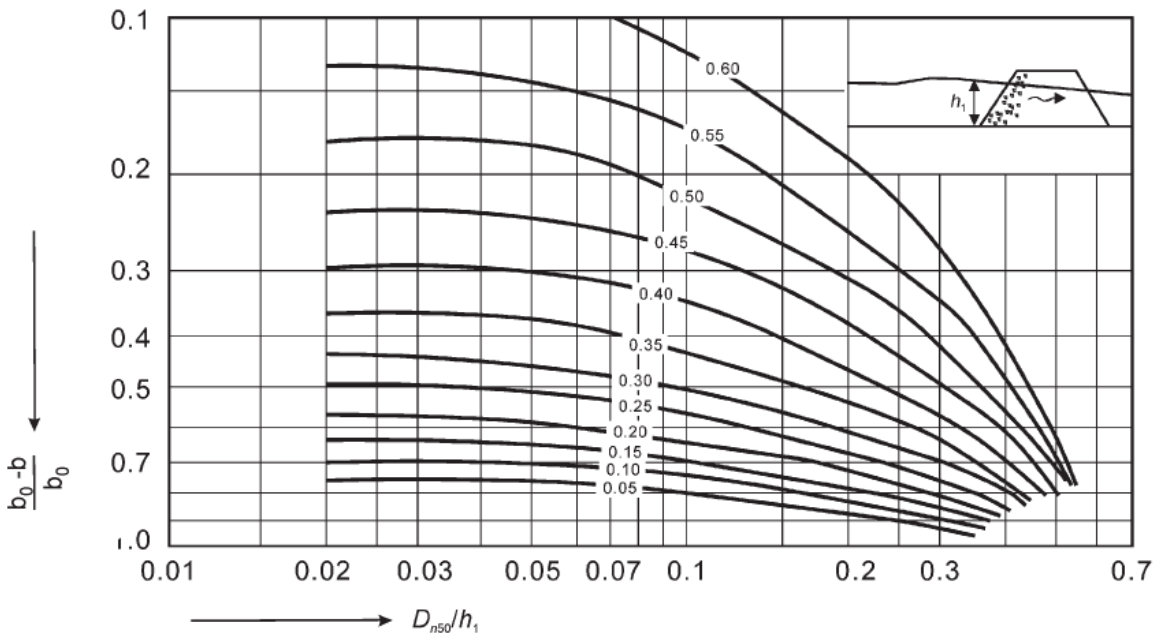


Figure 5.107

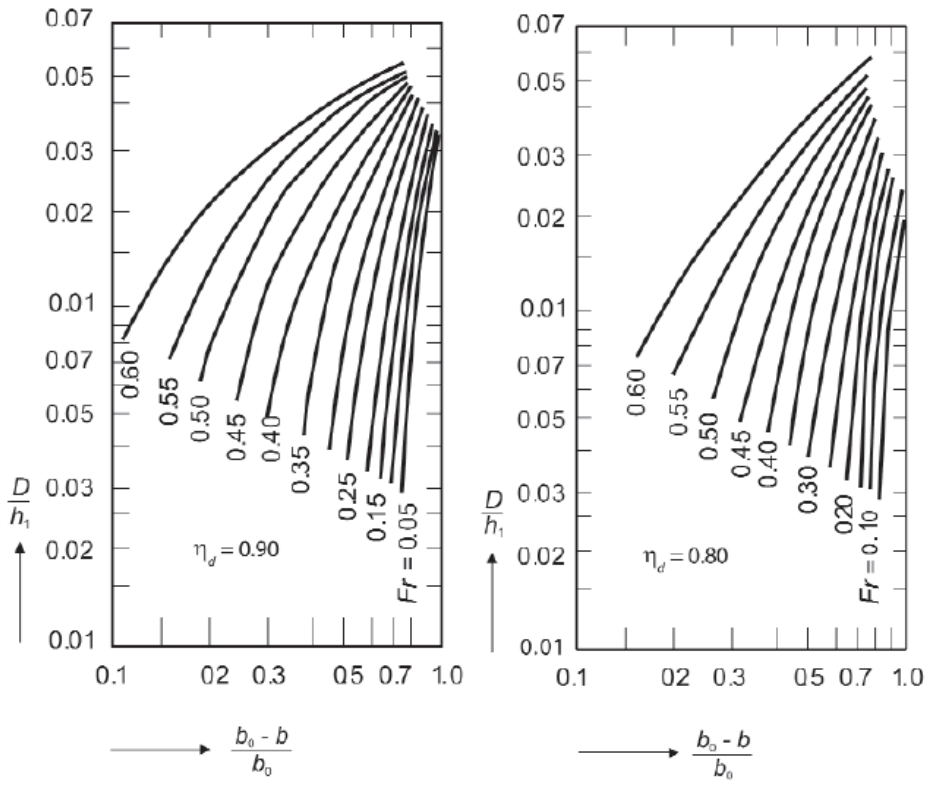


Figure 5.108

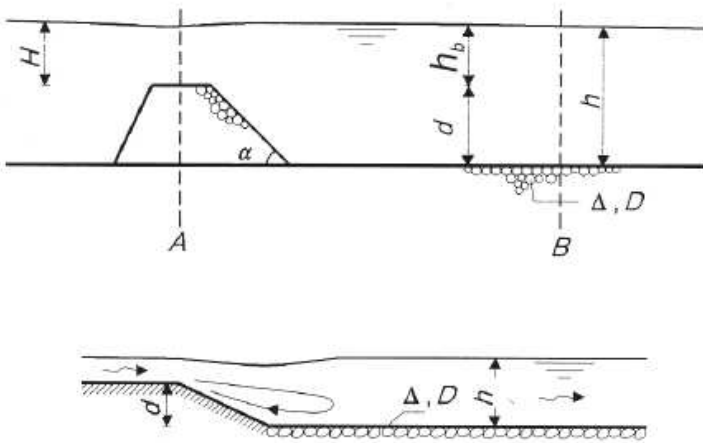


Figure 5.109

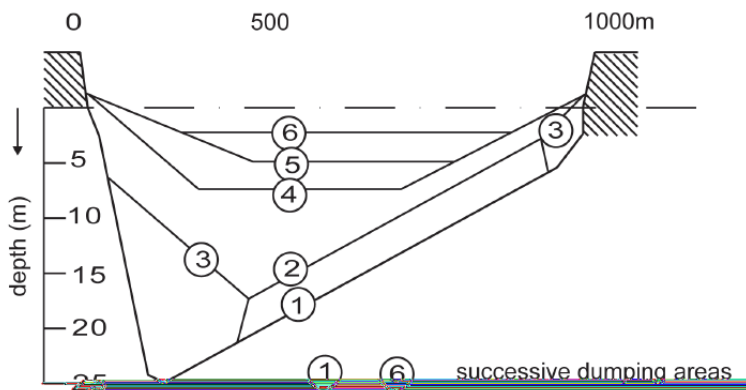


Figure 5.110

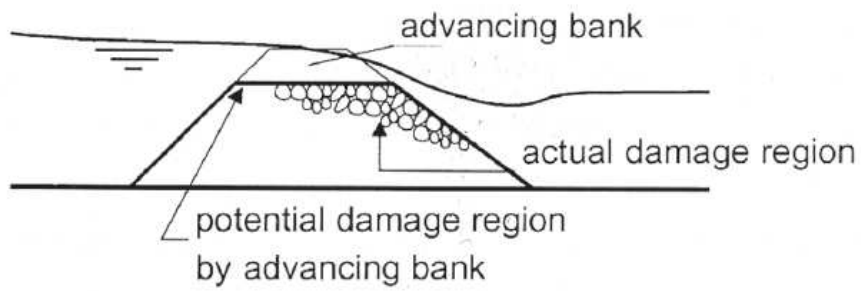


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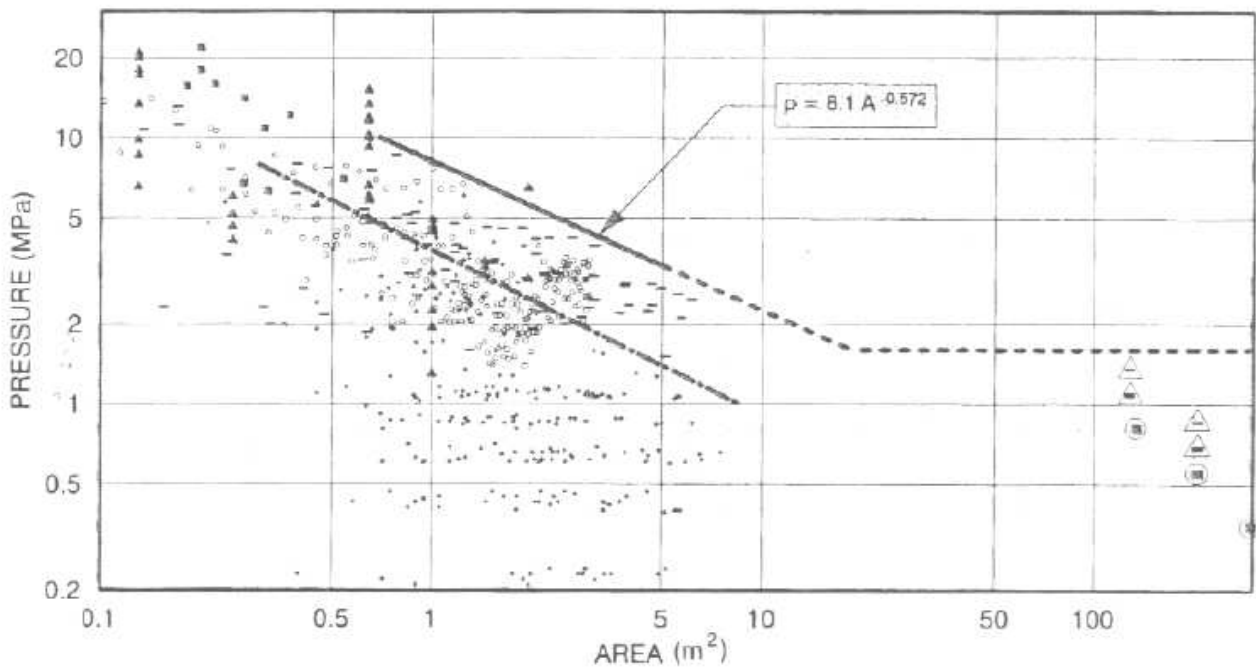


Figure 5.112

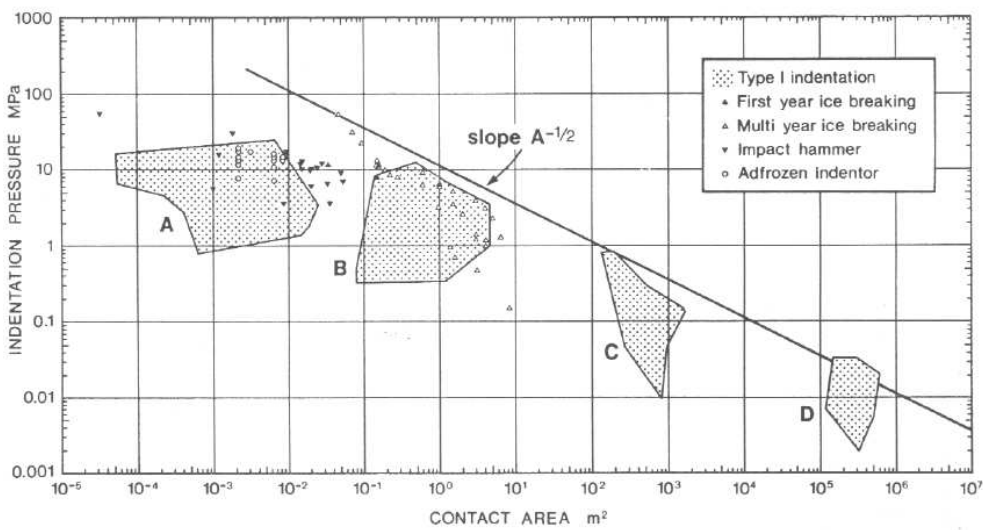


Figure 5.113

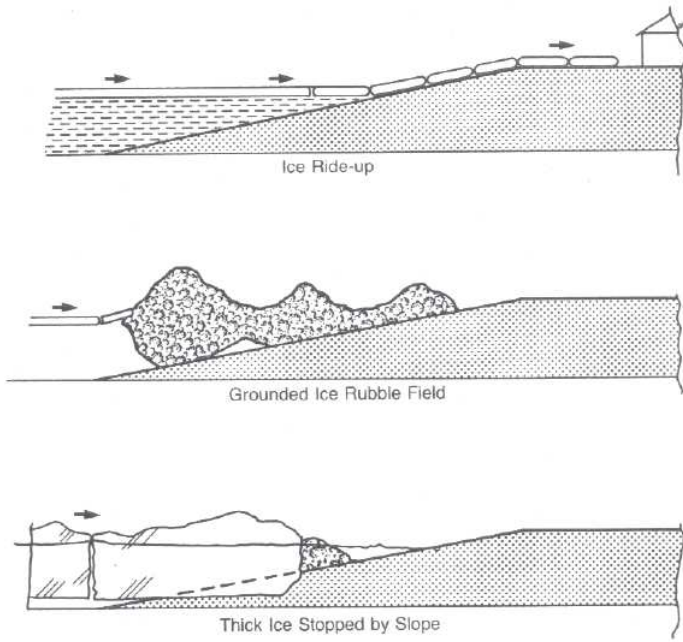


Figure 5.114

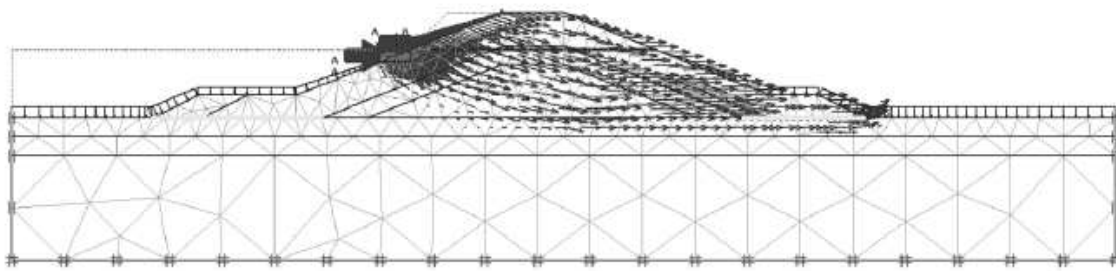


Figure 5.116

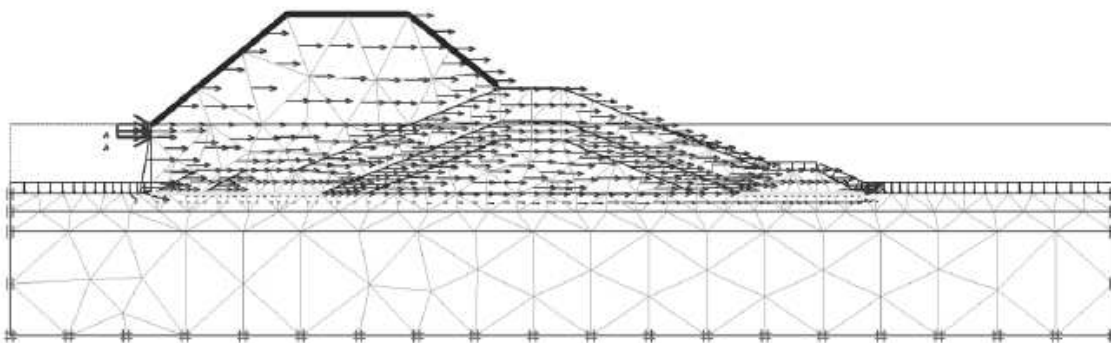
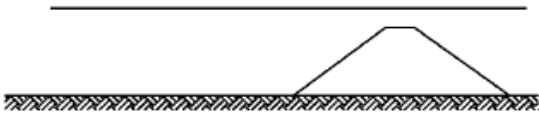
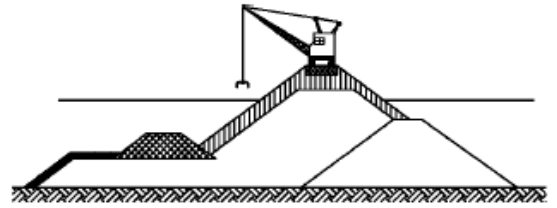


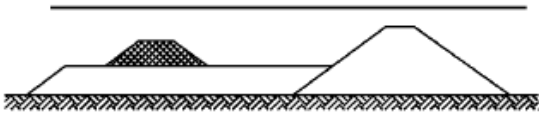
Figure 5.117



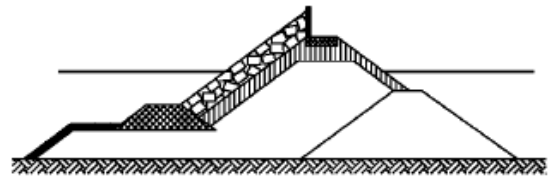
ULS  
 Erosion of unprotected materials under wave attack  
 Stability of slopes (particularly if top of structure can be above water)  
 Soil stability



ULS  
 Stability of slopes (attention should be paid to execution loads)  
 Stability of construction equipment  
 Soil stability

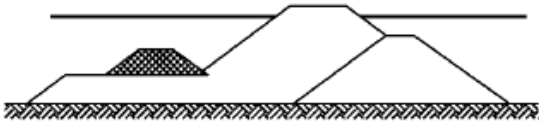


ULS  
 Erosion of unprotected materials under wave attack  
 Stability of slopes  
 Soil stability  
 Toe erosion

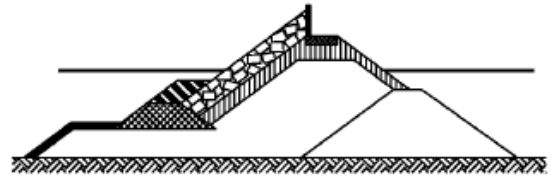


ULS  
 Sliding of the armour  
 Stability of slopes  
 Soil stability

SLS  
 Settlement

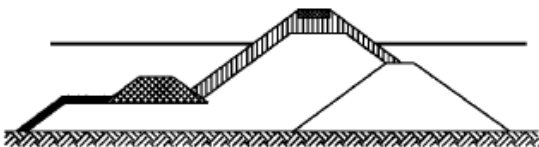


ULS  
 Erosion of unprotected outer slope (and inner slope in case of wave overtopping)  
 Stability of slopes  
 Soil stability  
 Toe erosion



ULS  
 Stability of slopes  
 Soil stability

SLS  
 Settlement  
 Deformation



ULS  
 Erosion of the armour and filter layers  
 Stability of slopes  
 Soil stability

Figure 5.123

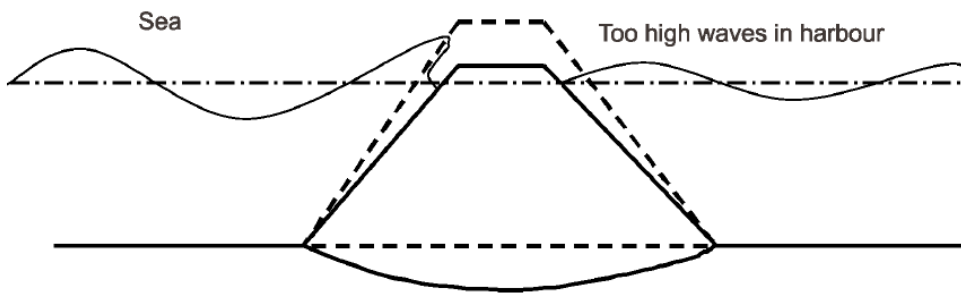


Figure 5.124

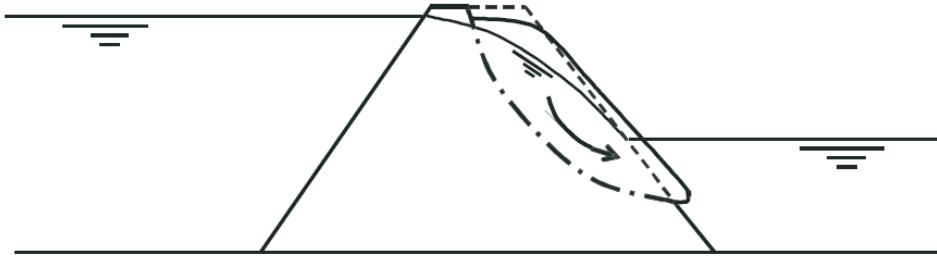
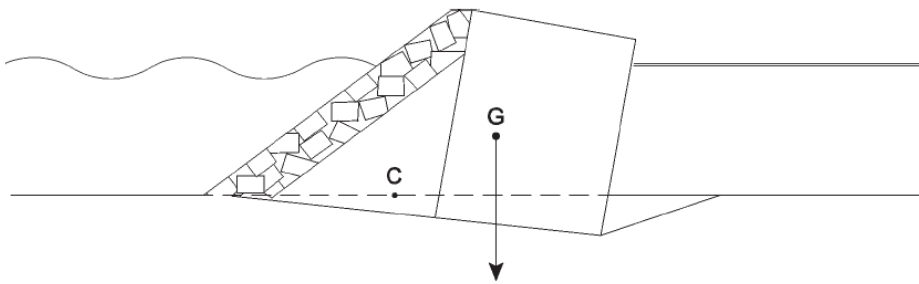


Figure 5.125



C : Centre of the foundation  
G : Centre of gravity

Figure 5.126

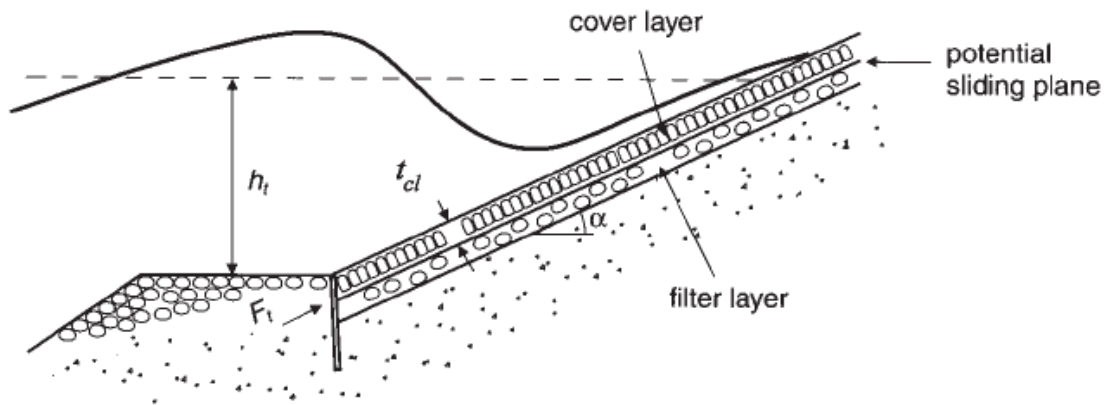


Figure 5.127

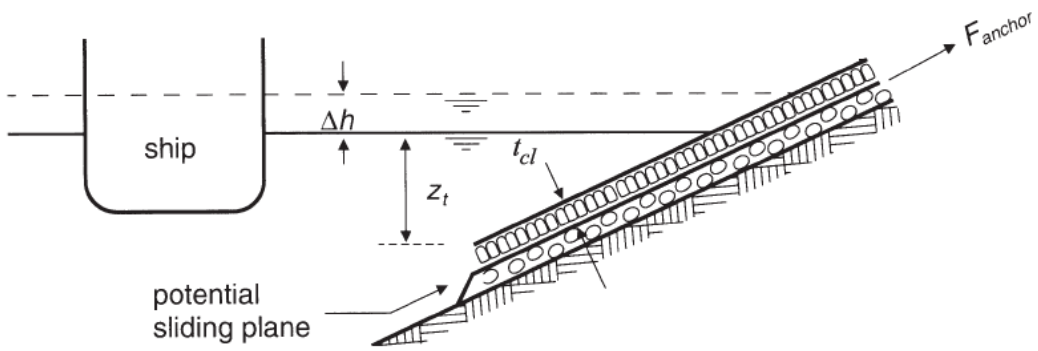


Figure 5.128

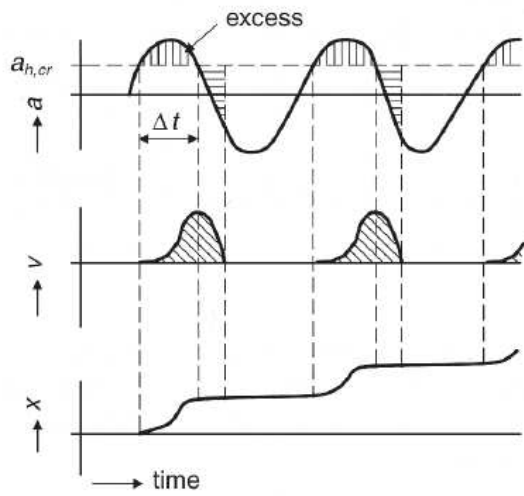


Figure 5.132

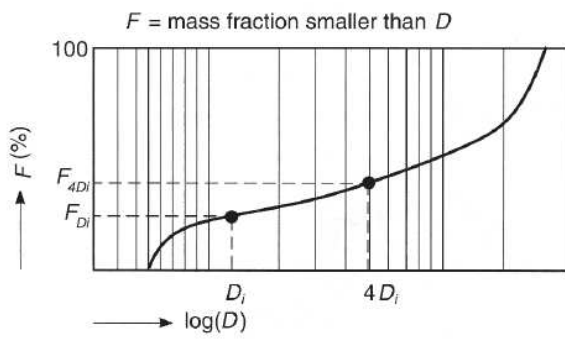


Figure 5.133

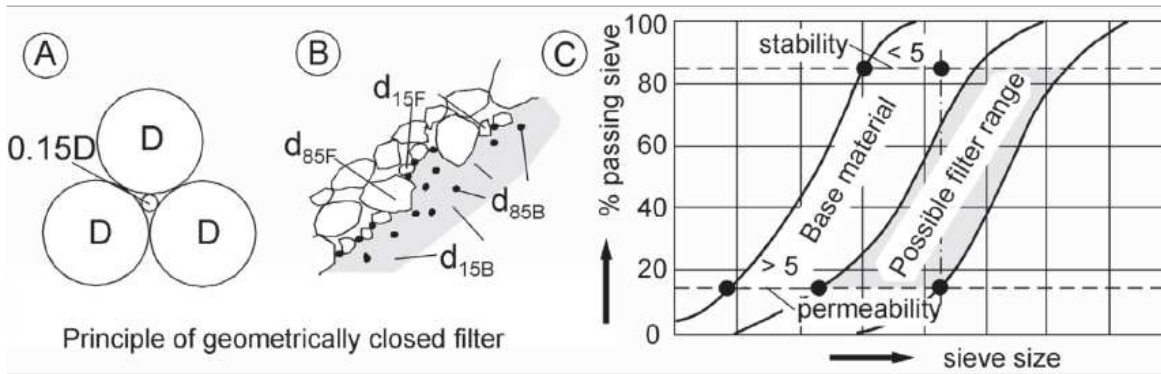


Figure 5.134

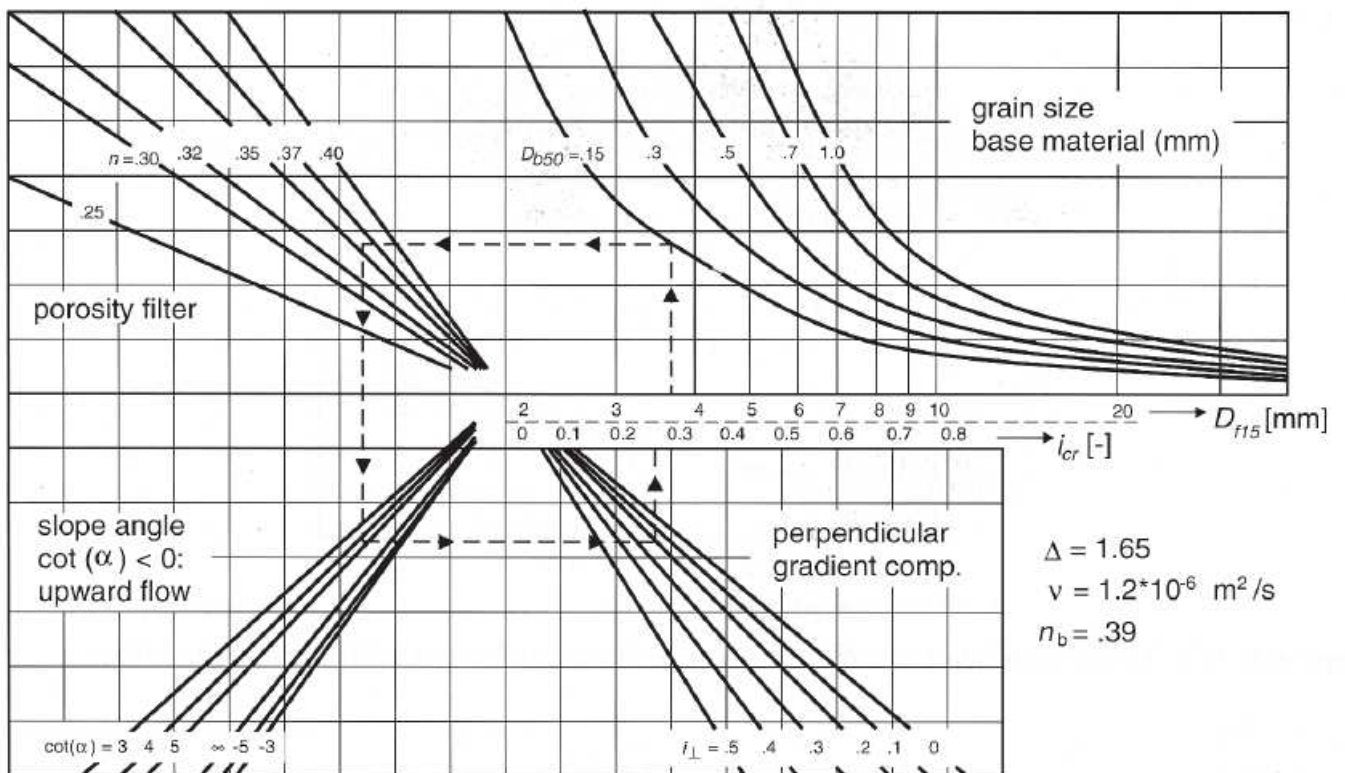


Figure 5.135



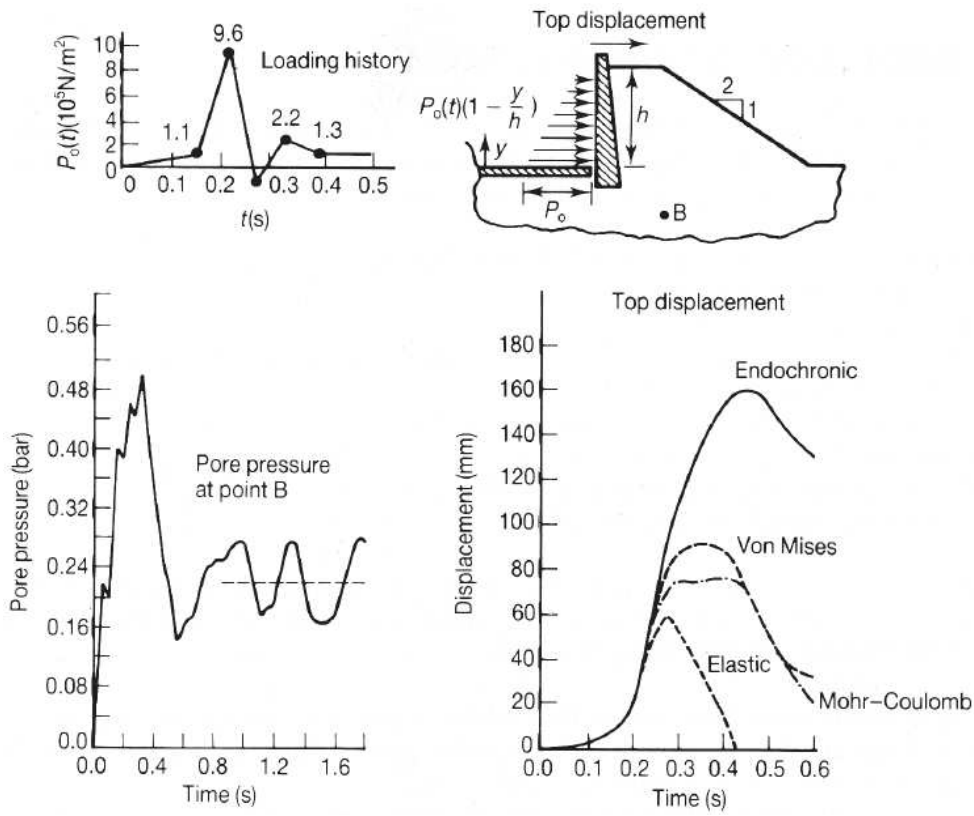


Figure 5.137

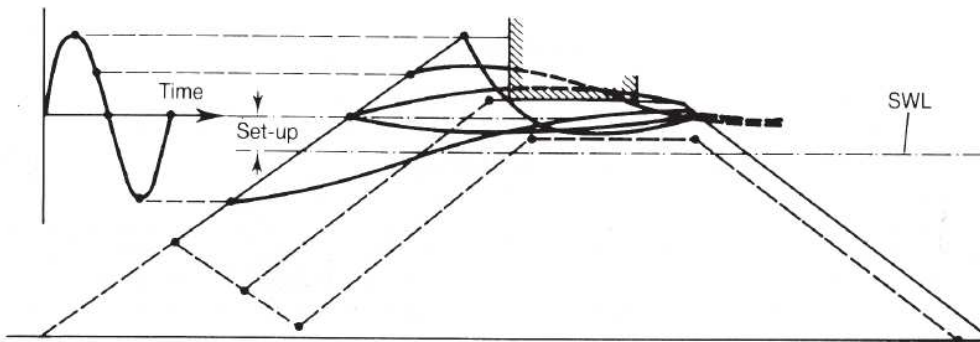
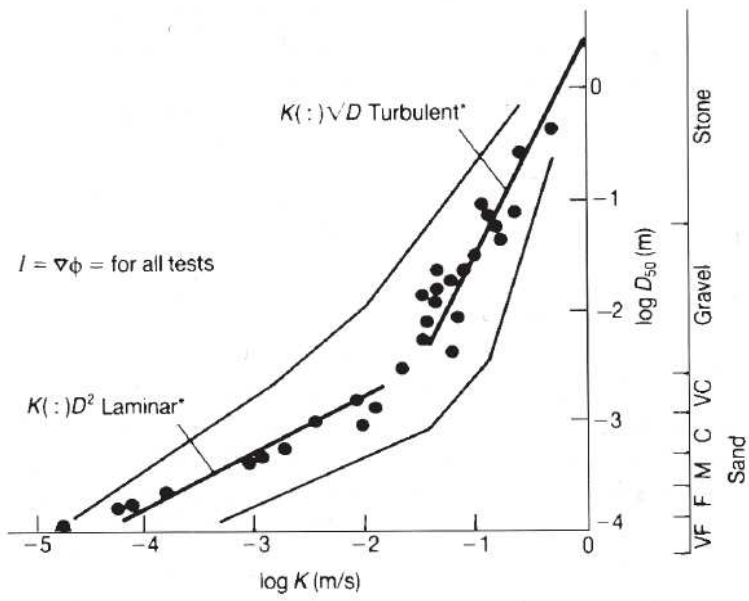


Figure 5.138



\*Refers to porous flow regime in which permeability ( $K$ ) – grain size ( $D_{50}$ ) relation has been measured.

Figure 5.139

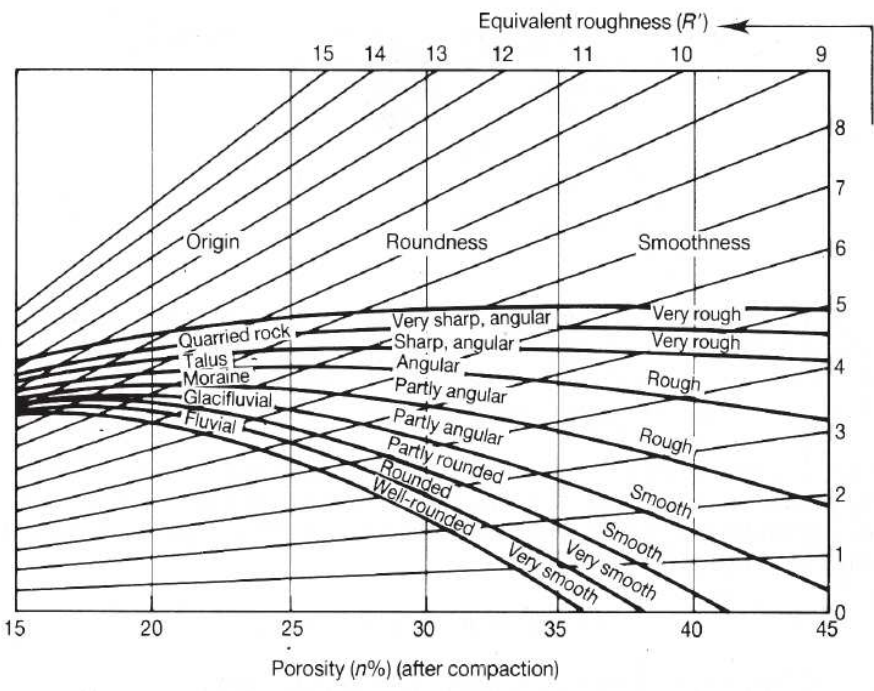


Figure 5.140

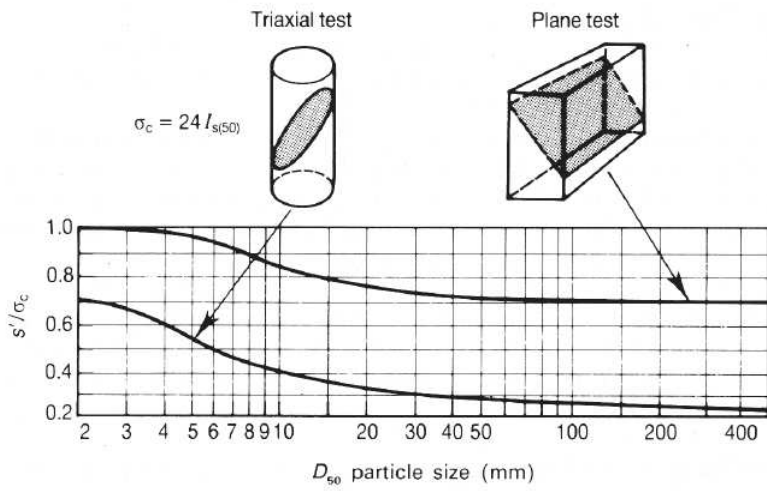


Figure 5.141

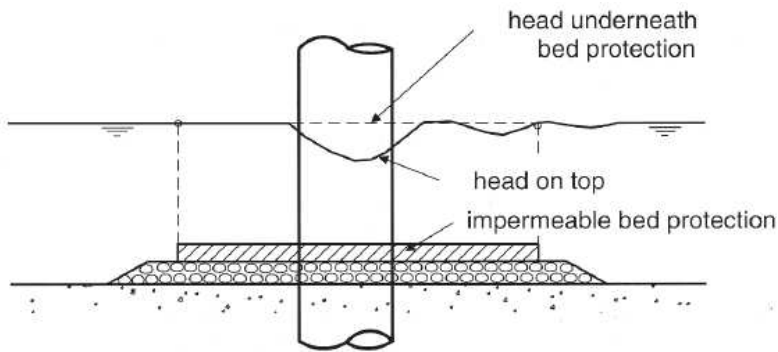


Figure 5.145

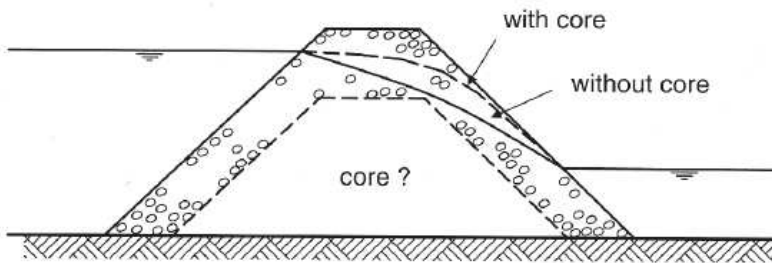


Figure 5.146

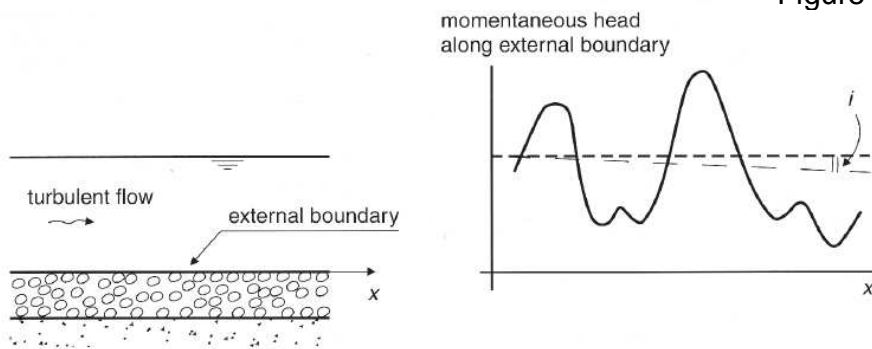


Figure 5.150

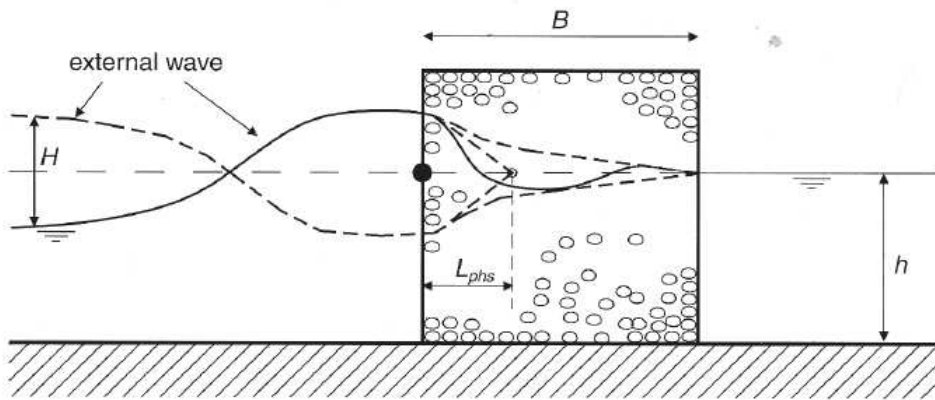


Figure 5.151

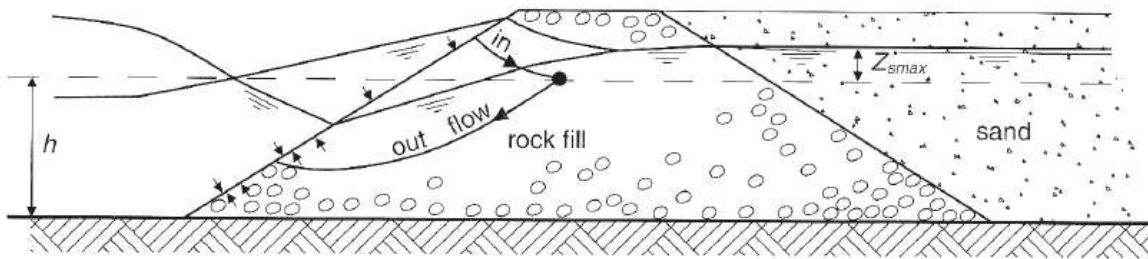


Figure 5.153

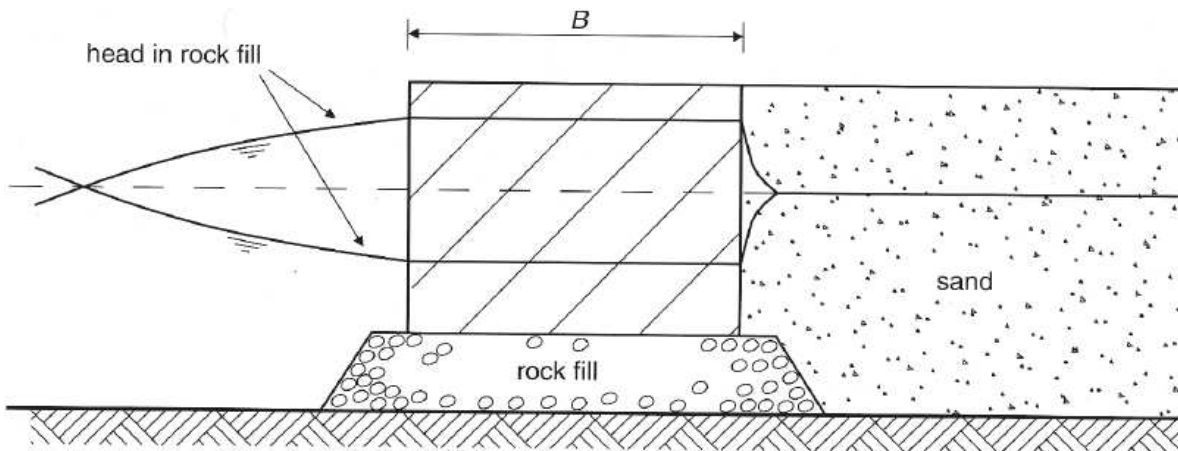


Figure 5.154

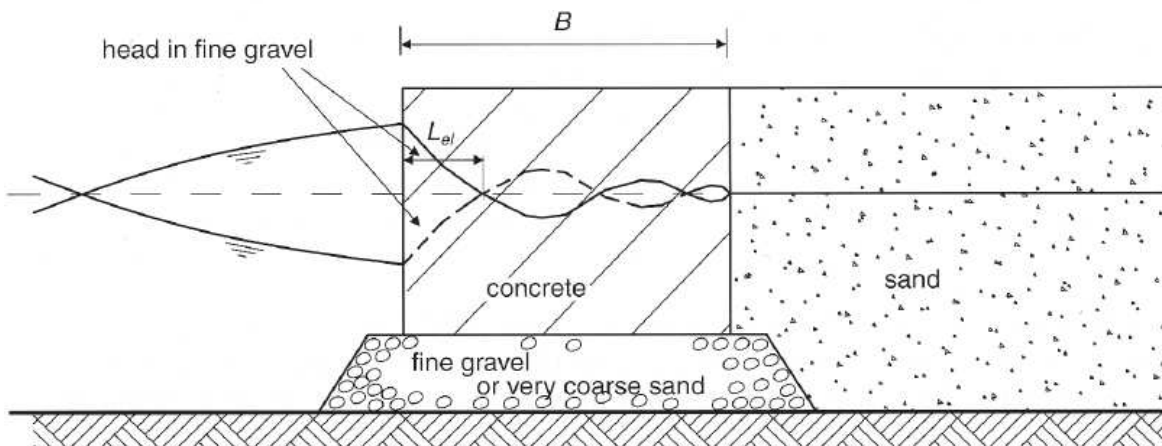


Figure 5.155

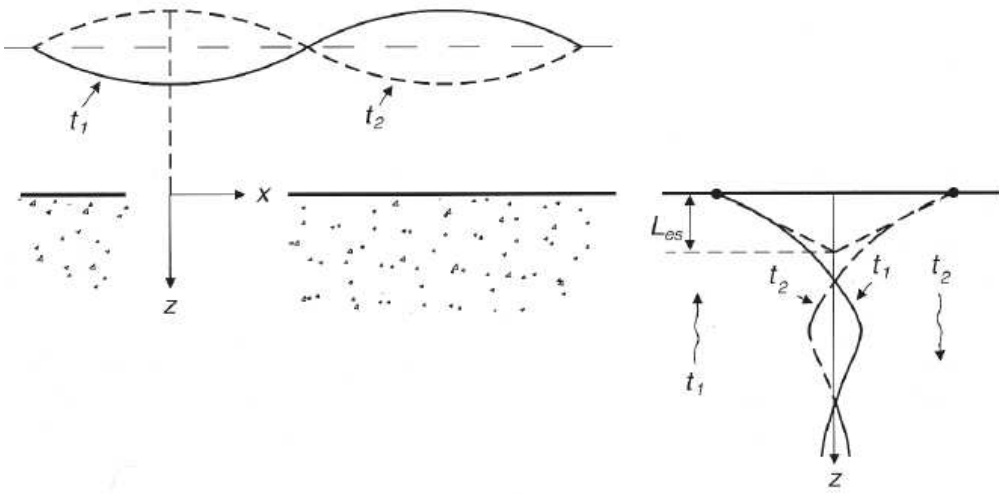


Figure 5.156

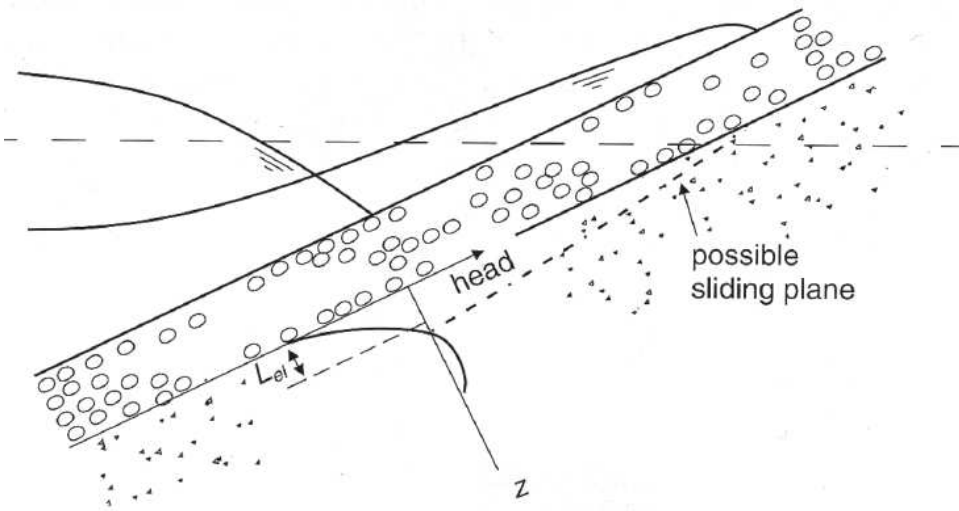


Figure 5.157

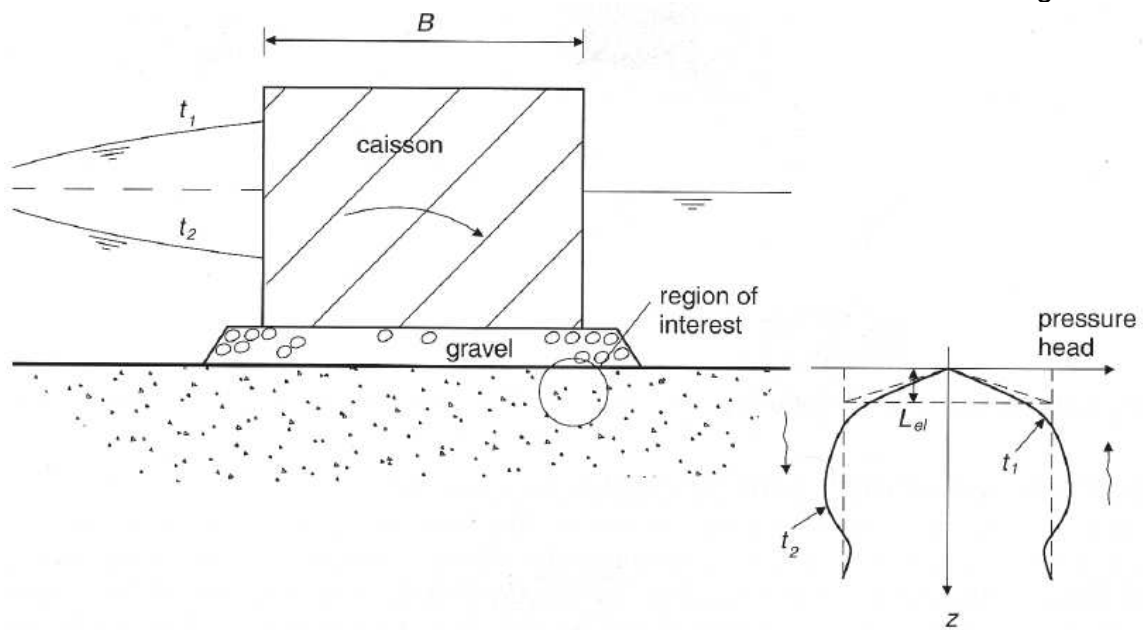


Figure 5.158

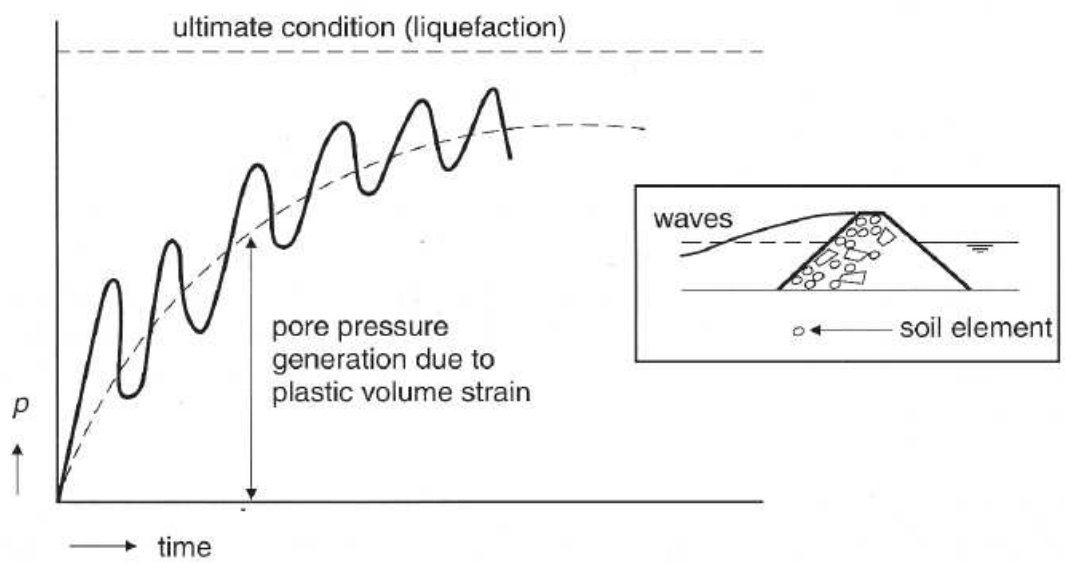


Figure 5.159

Figures from Chapter 6:

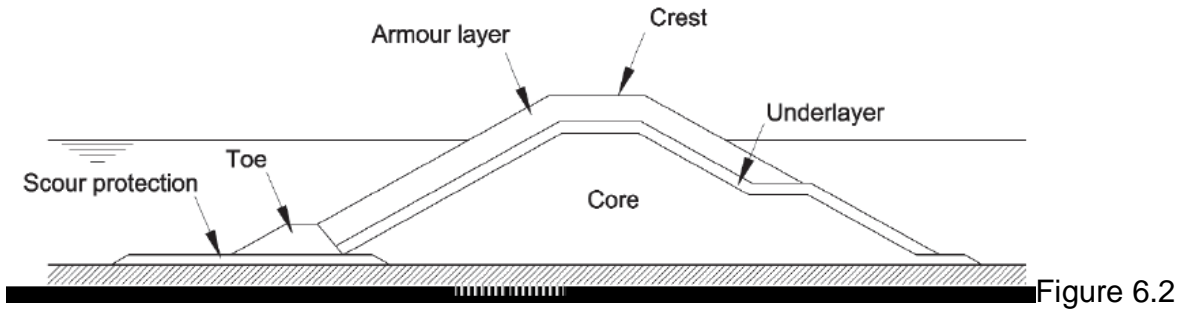


Figure 6.2

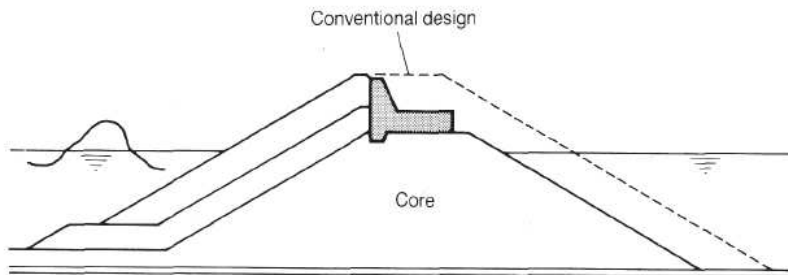


Figure 6.23

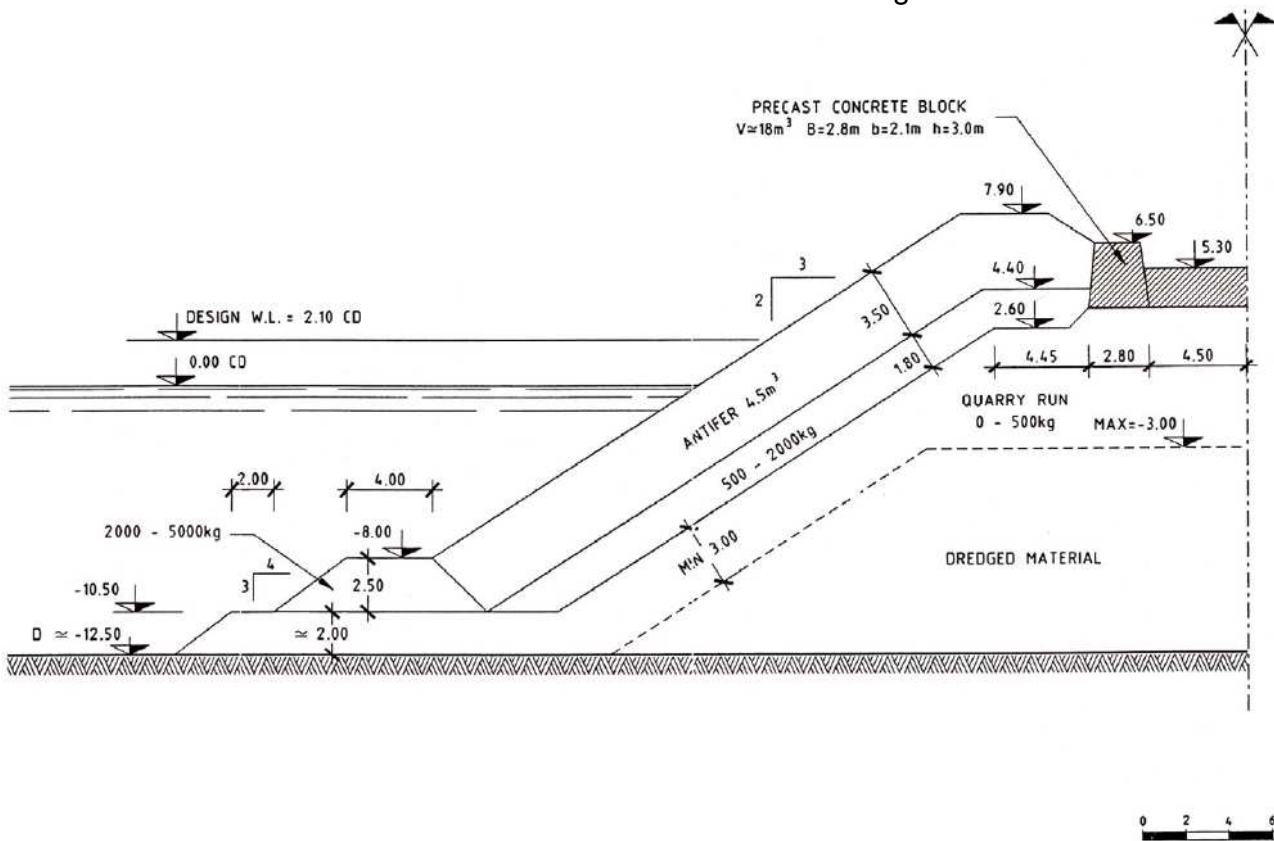


Figure 6.27

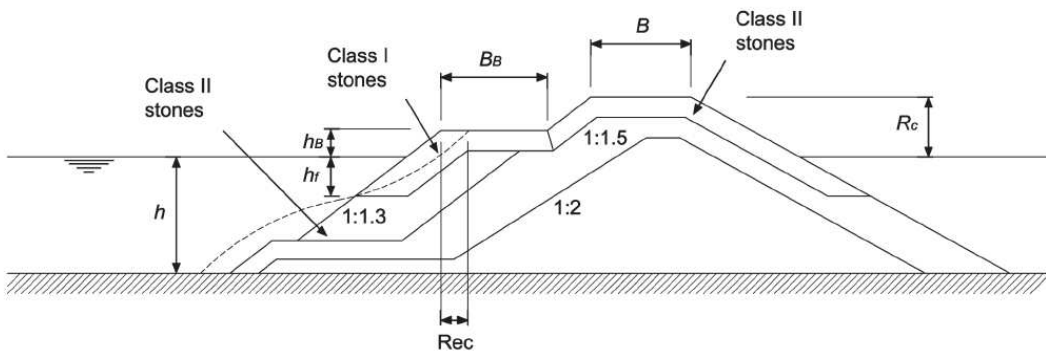


Figure 6.29

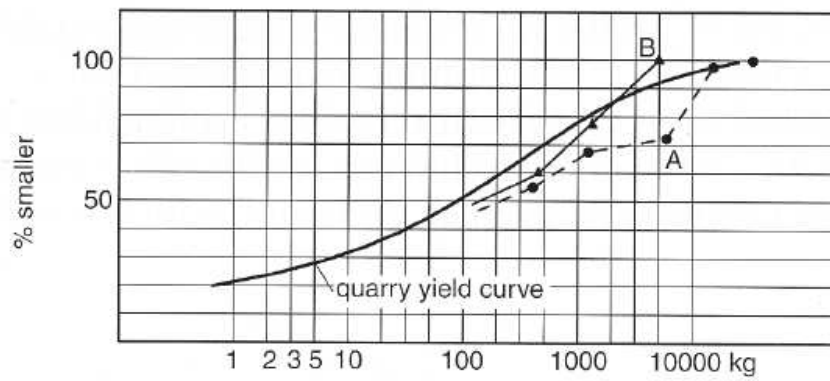
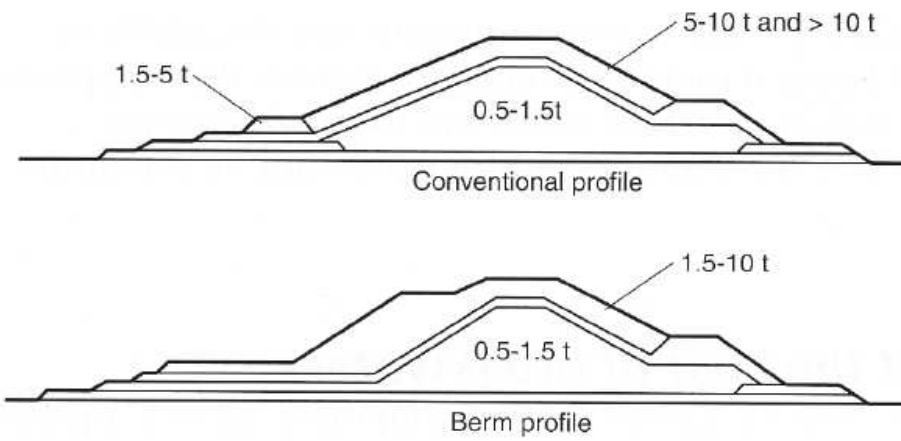
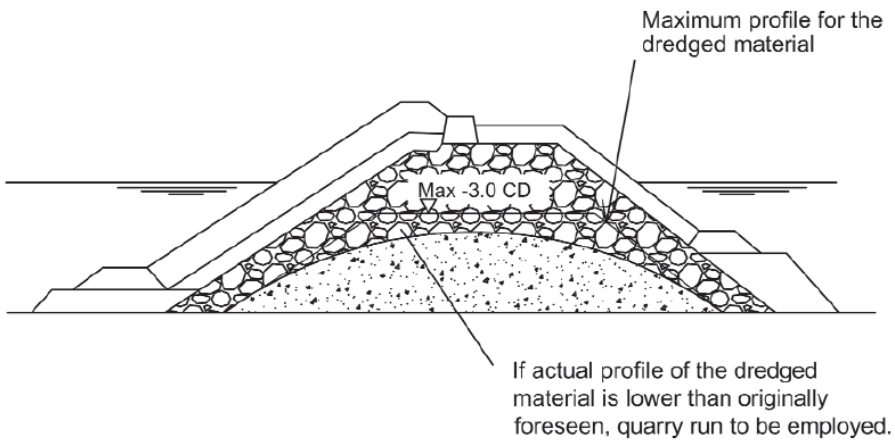
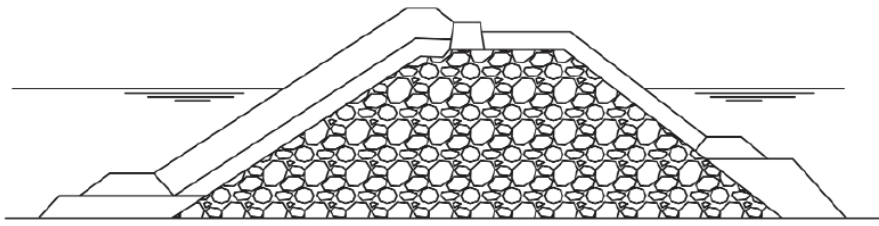


Figure 6.34





LEGEND



QUARRY RUN



DREDGED MATERIAL

Figure 6.35

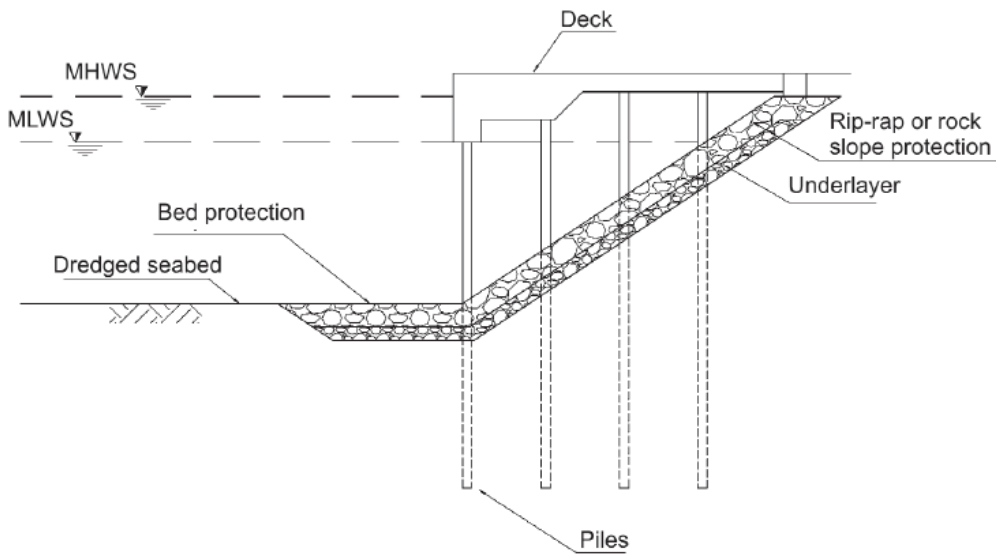


Figure 6.38

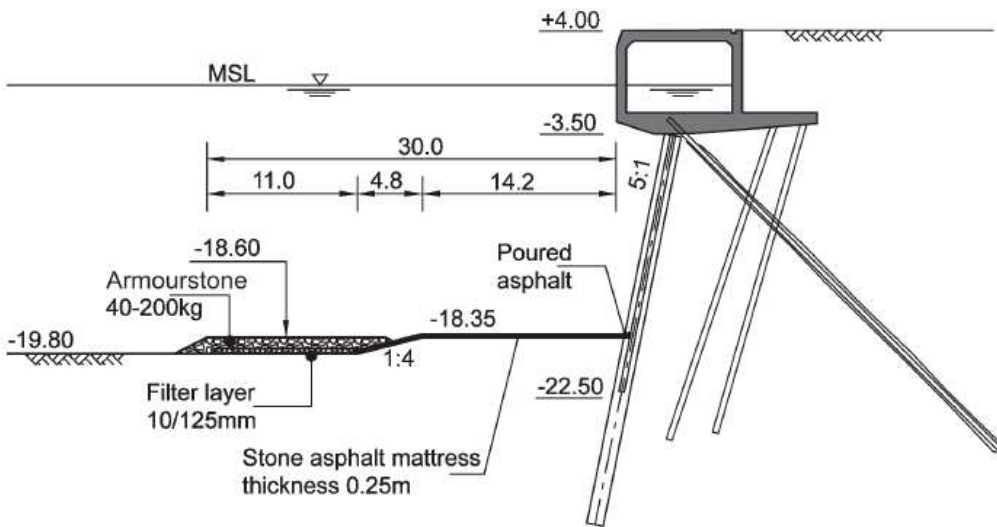


Figure 6.39

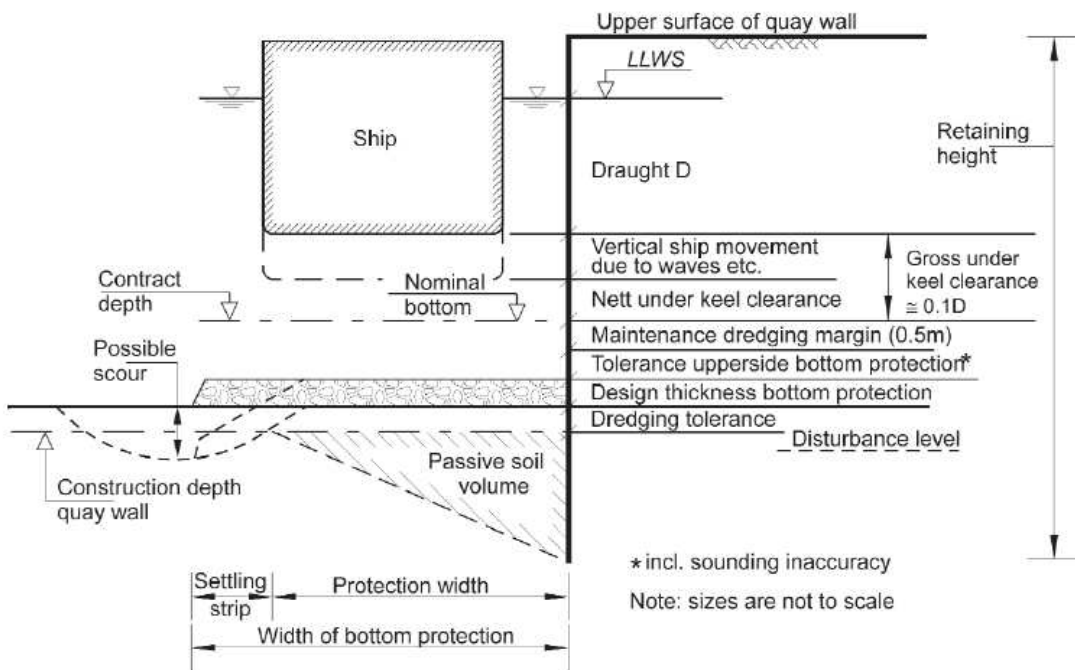
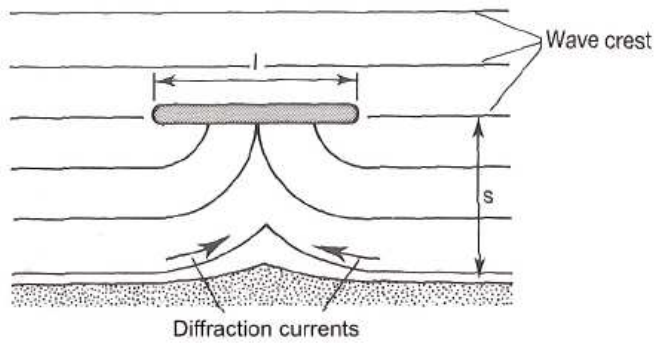
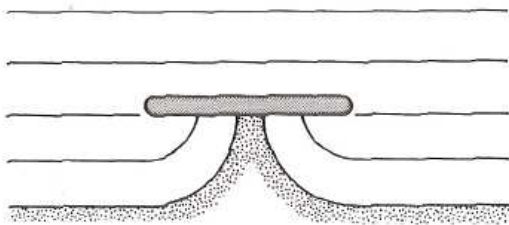


Figure 6.40



Development of depositional feature behind offshore breakwater,  $l/s < 2$ , salient formed



Equilibrium depositional feature behind offshore breakwater,  $l/s > 2$ , tombolo formed

Figure 6.51

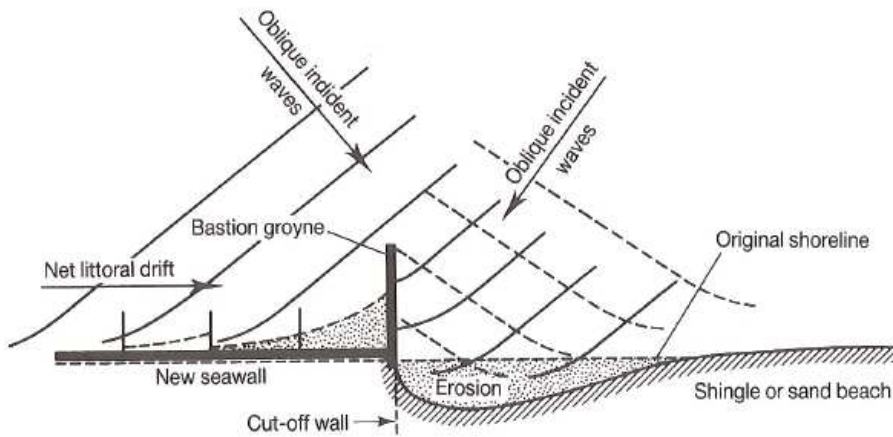


Figure 6.67

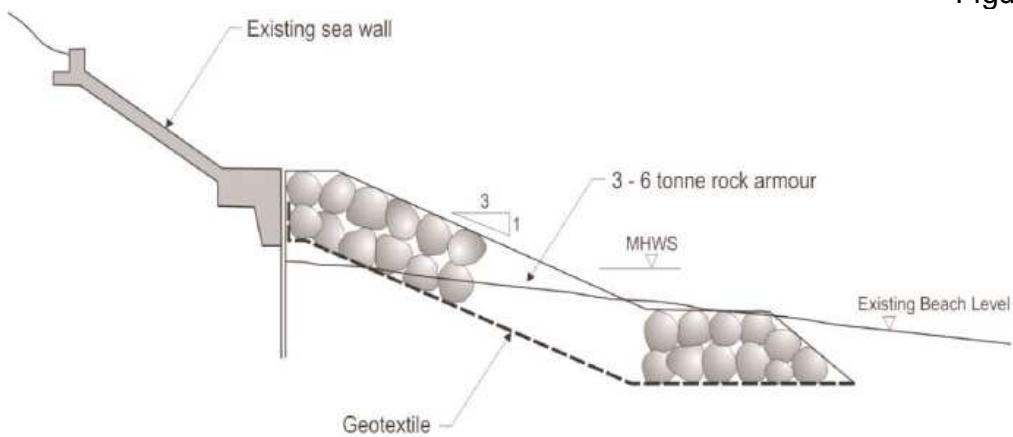


Figure 6.70

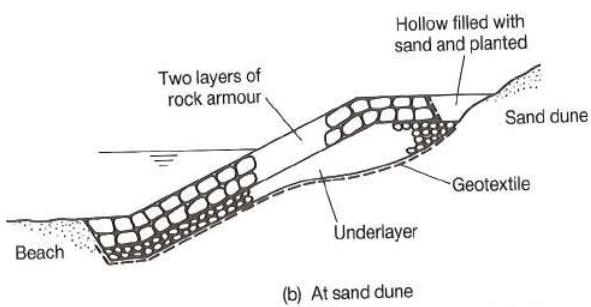
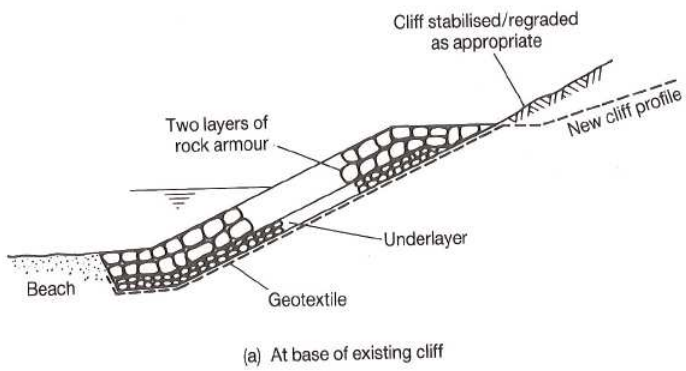


Figure 6.72

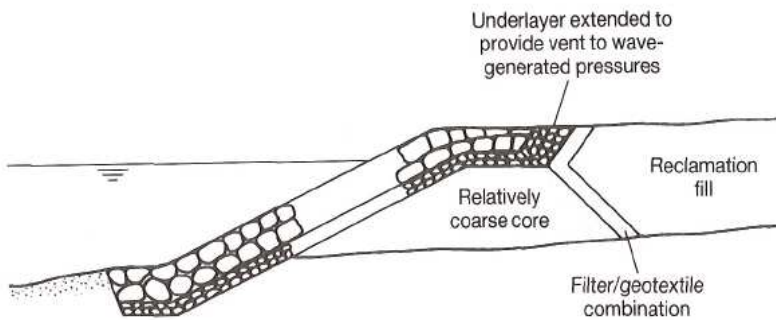


Figure 6.74

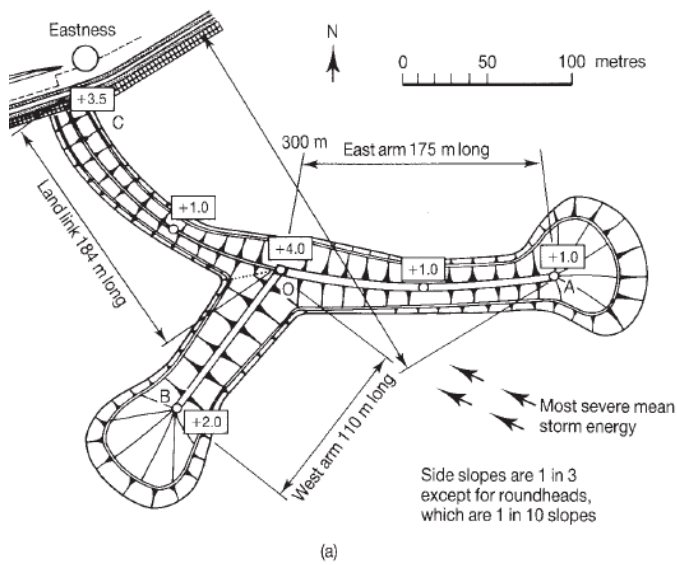


Figure 6.78

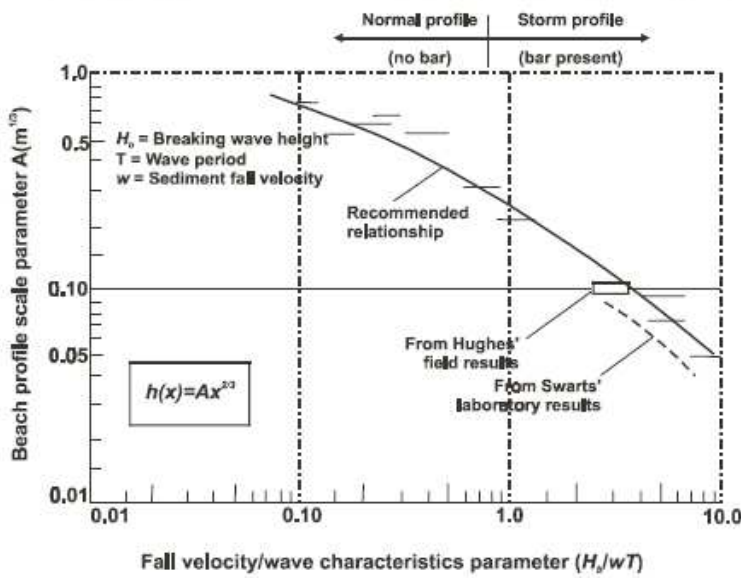
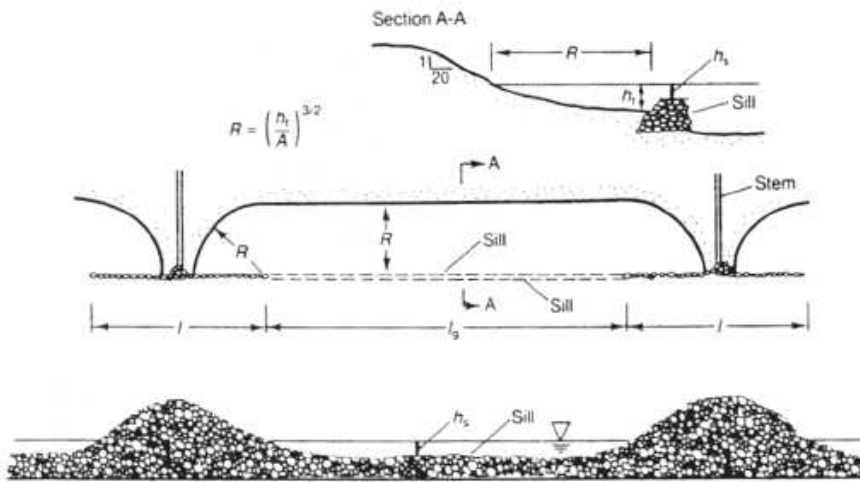


Figure 6.80

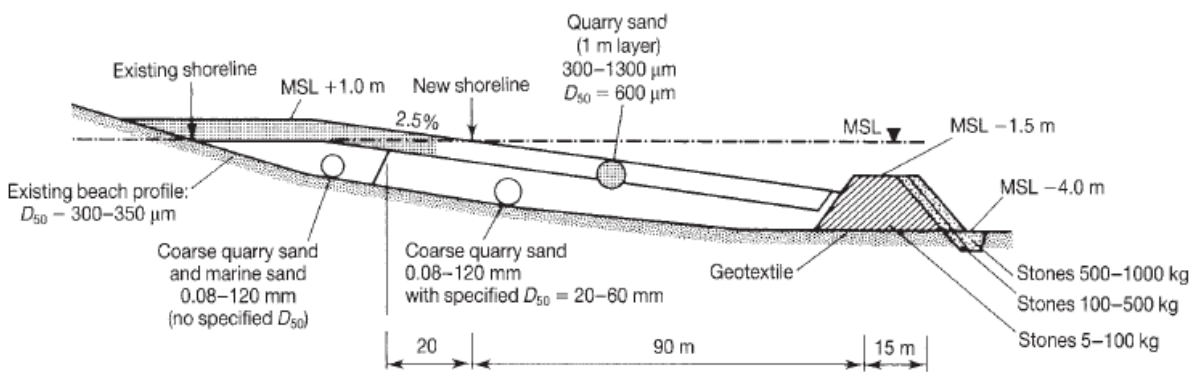


Figure 6.81

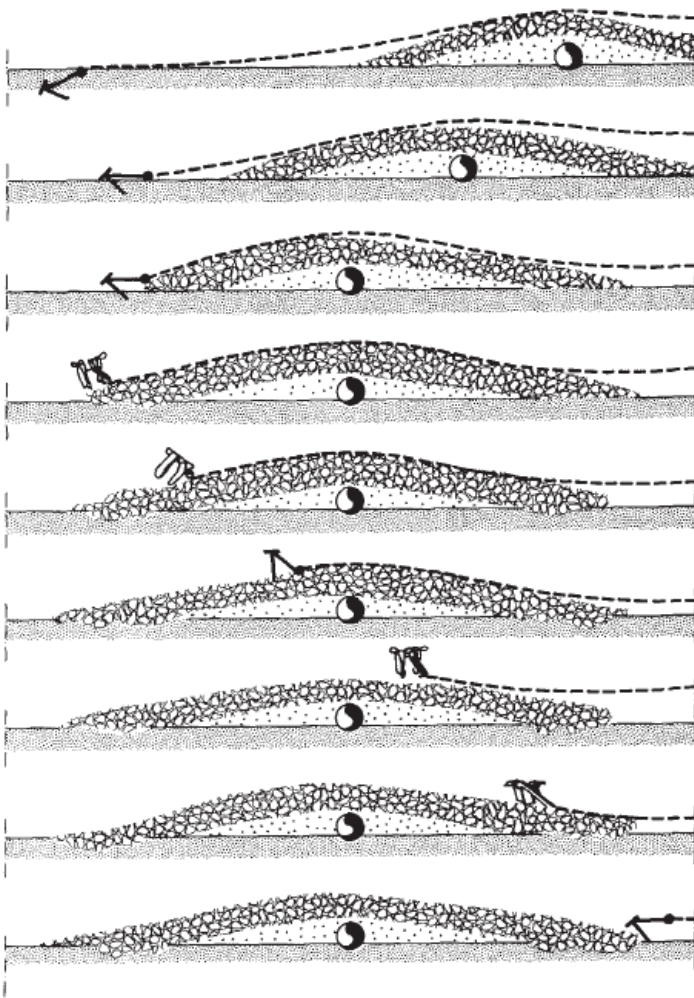


Figure 6.85

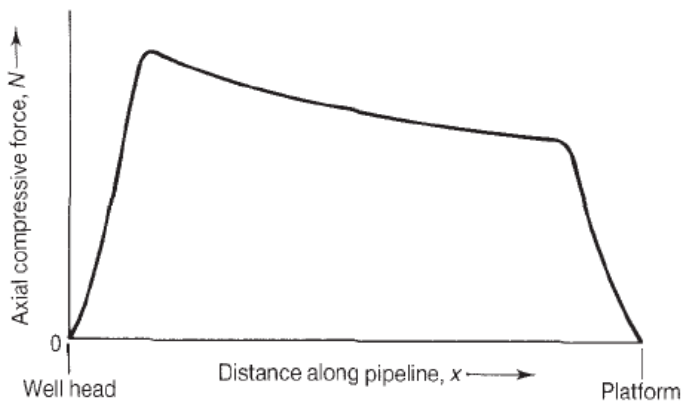


Figure 6.86

Figures from Chapter 7:

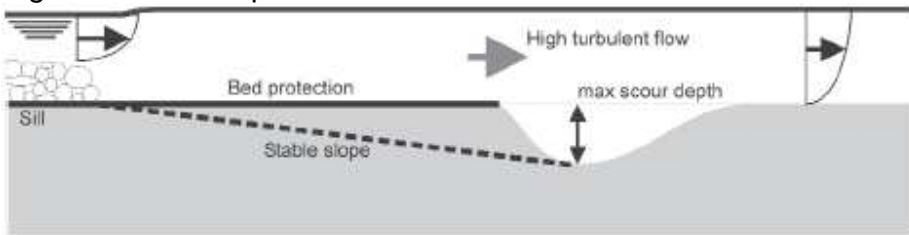


Figure 7.10

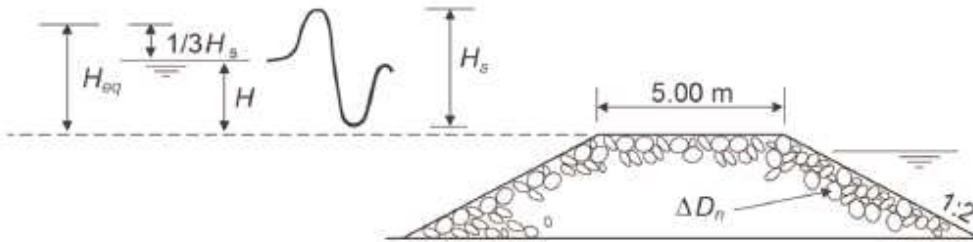
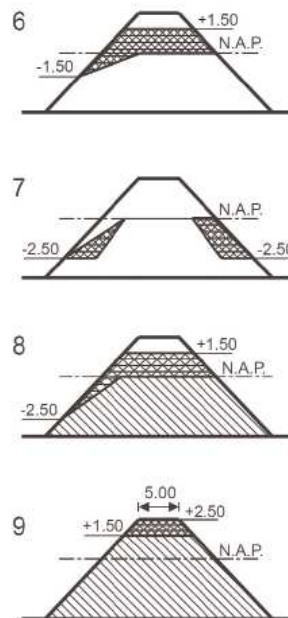
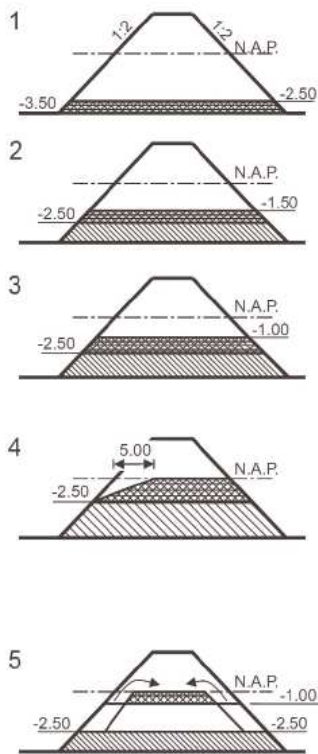
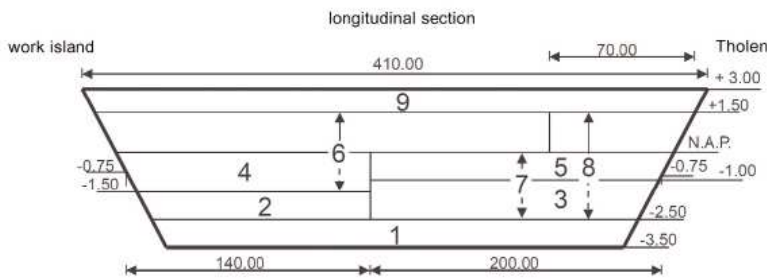


Figure 7.13



armourstone 300-1000 kg

Figure 7.14

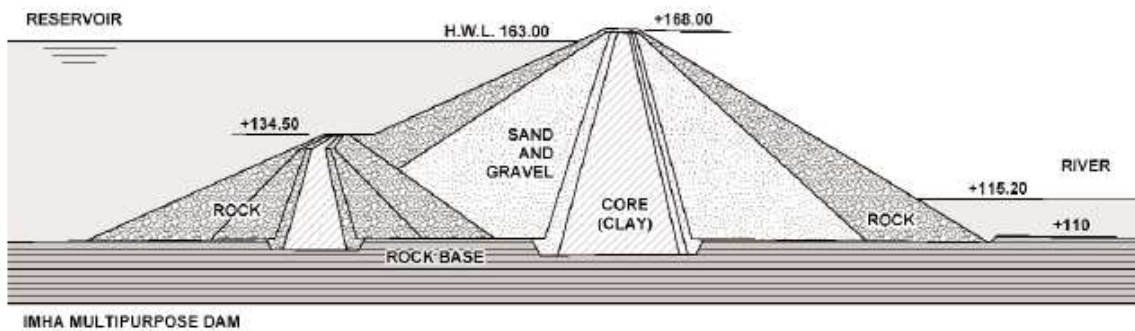


Figure 7.26

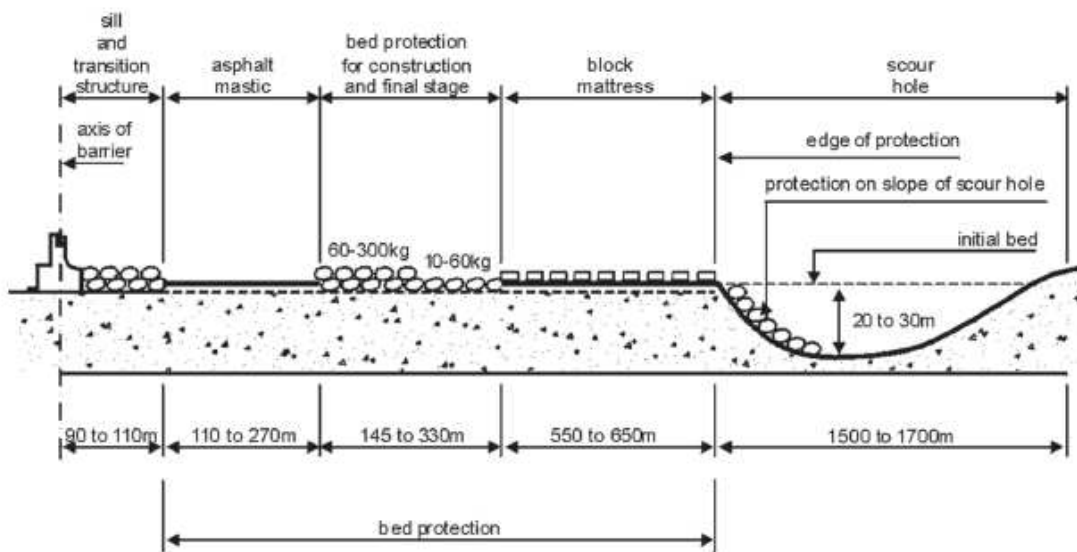


Figure 7.27



Figures of Chapter 8:

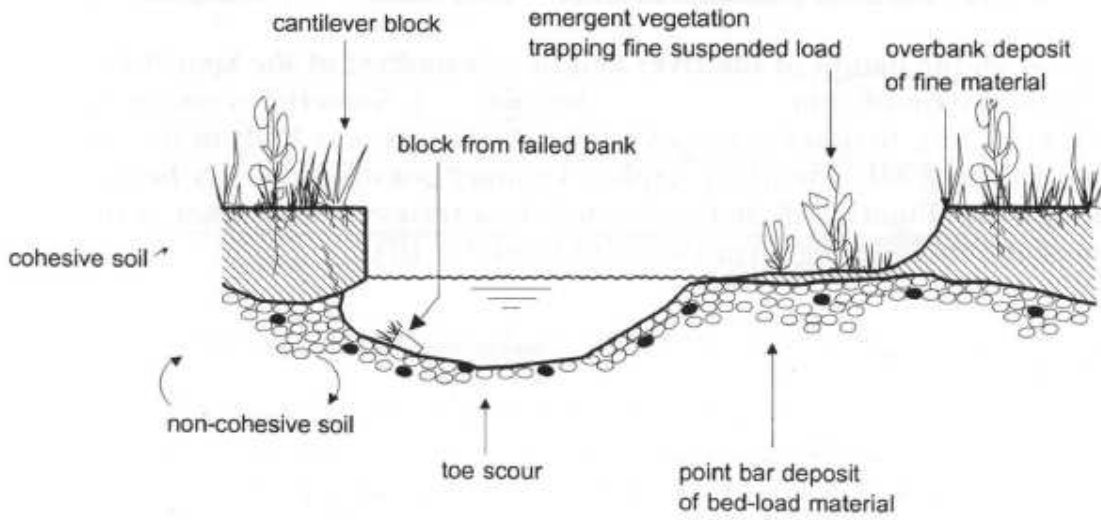


Figure 8.8

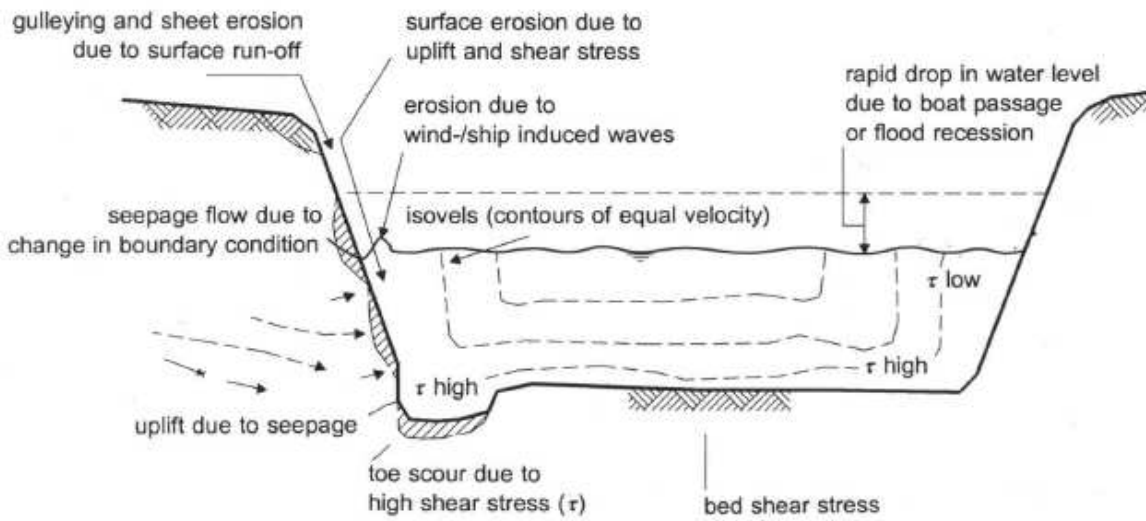


Figure 8.9

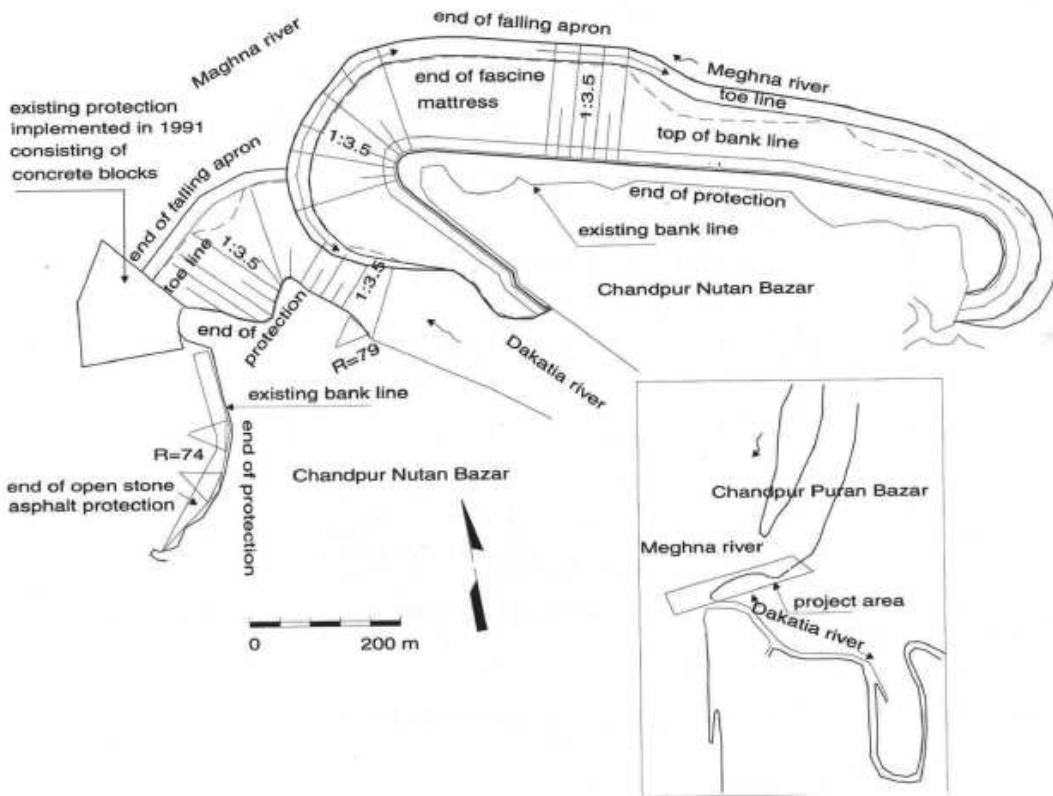


Figure 8.15

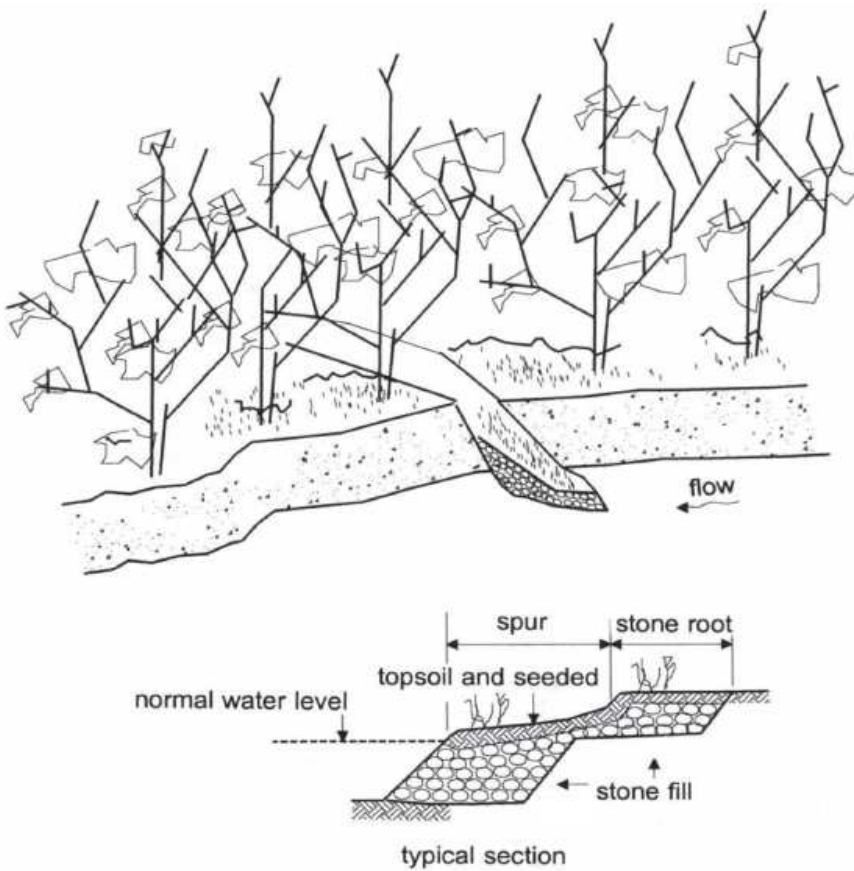


Figure 8.16

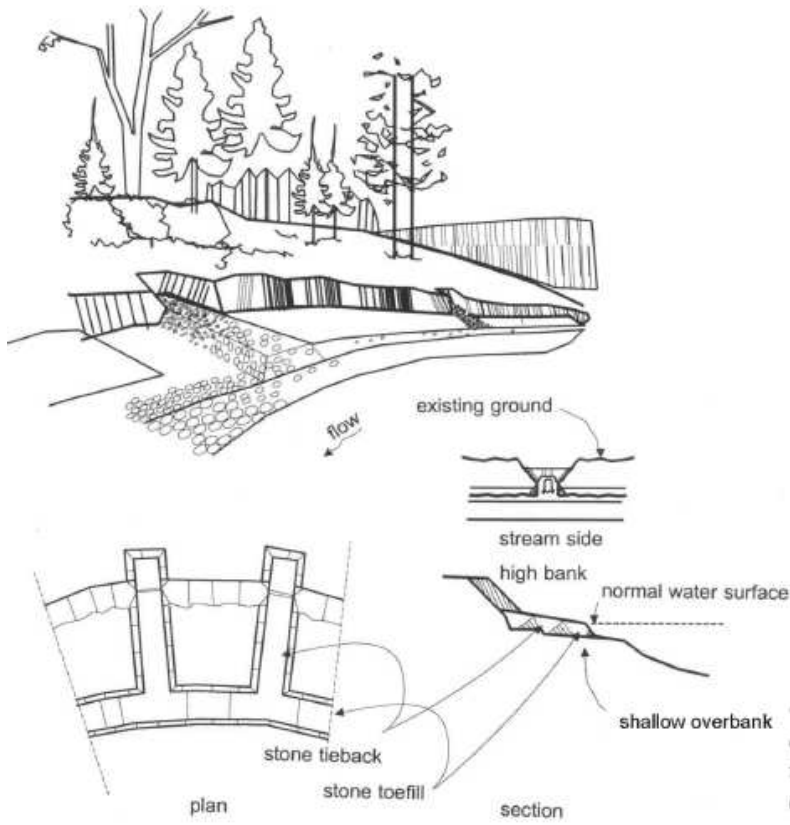


Figure 8.19

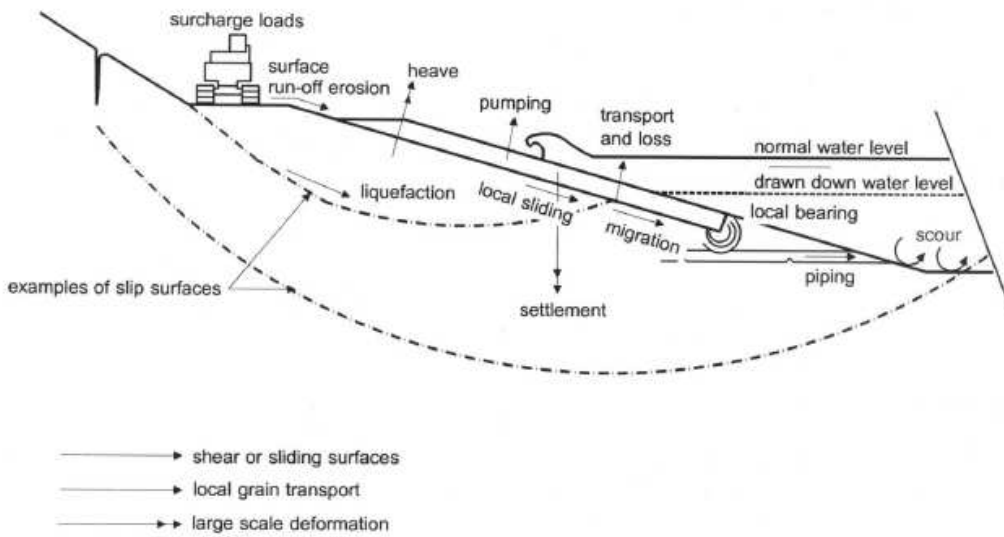
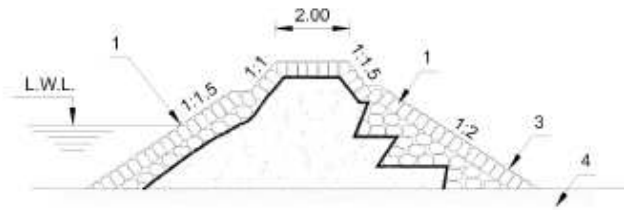
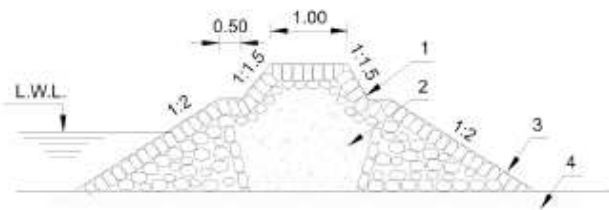


Figure 8.22

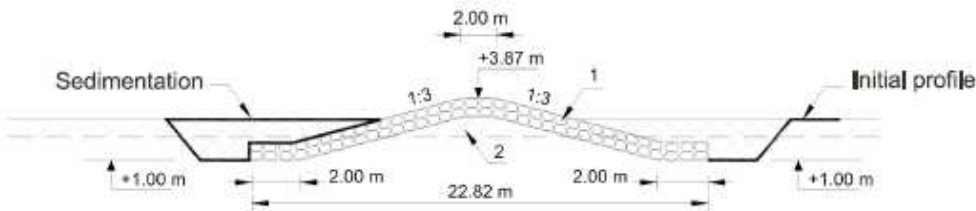


(a) High spur or longitudinal dike



(b) High spur or longitudinal dike

- 1 Cover layer (loose, pitched or grouted stones)
- 2 Gravel
- 3 Rip-rap
- 4 Sub-soil or coarse-broken stone



(c) Low spur-dike

Figure 8.23

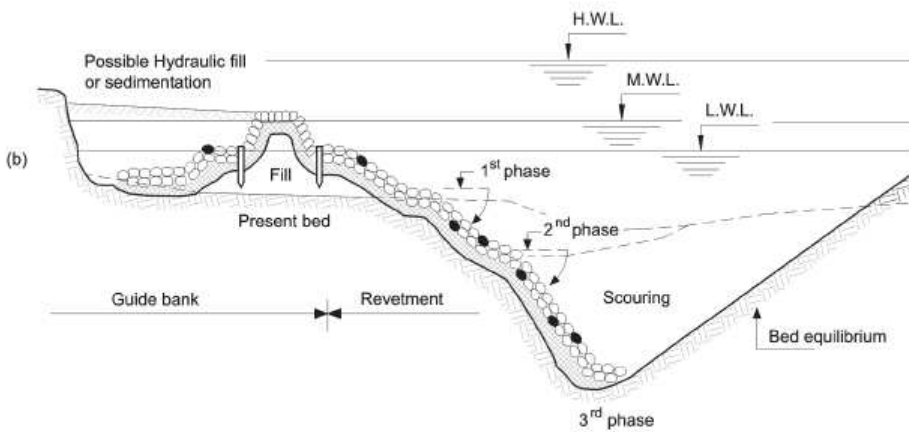
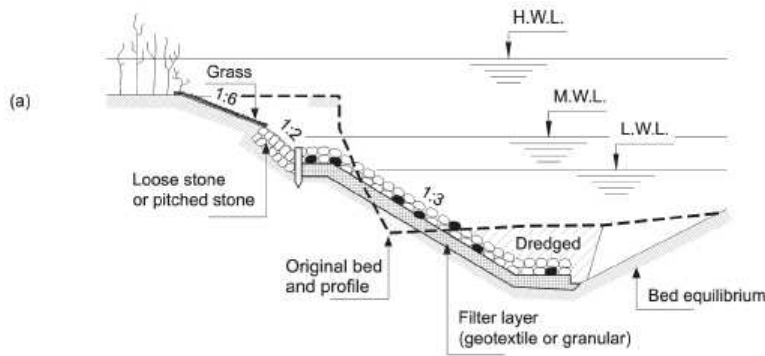


Figure 8.24

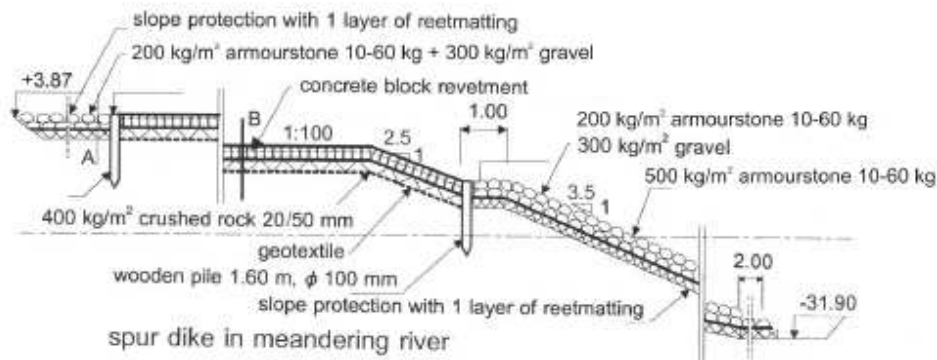
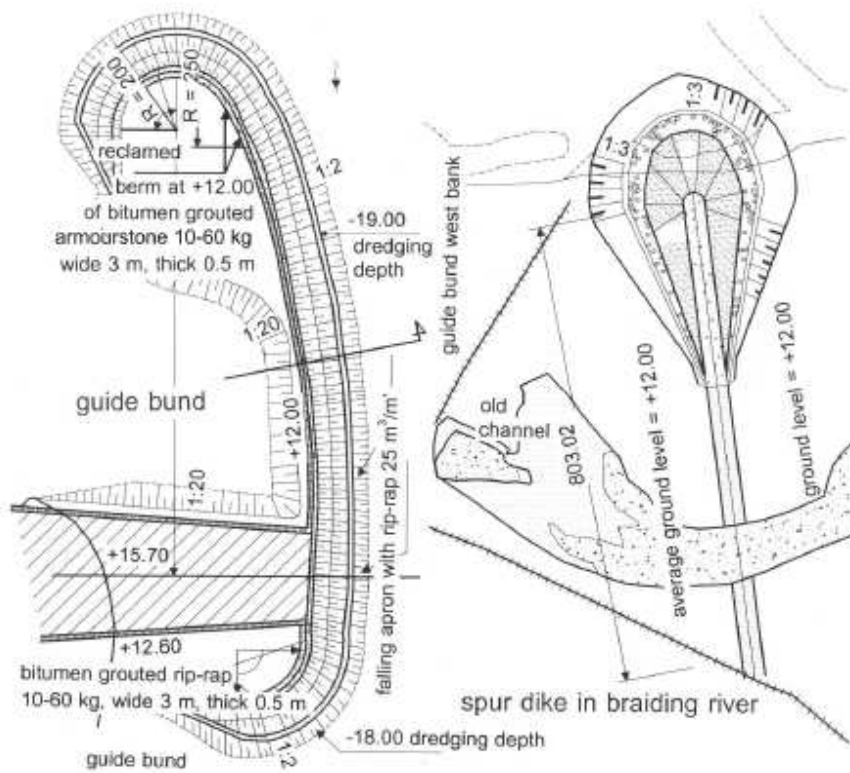


Figure 8.25

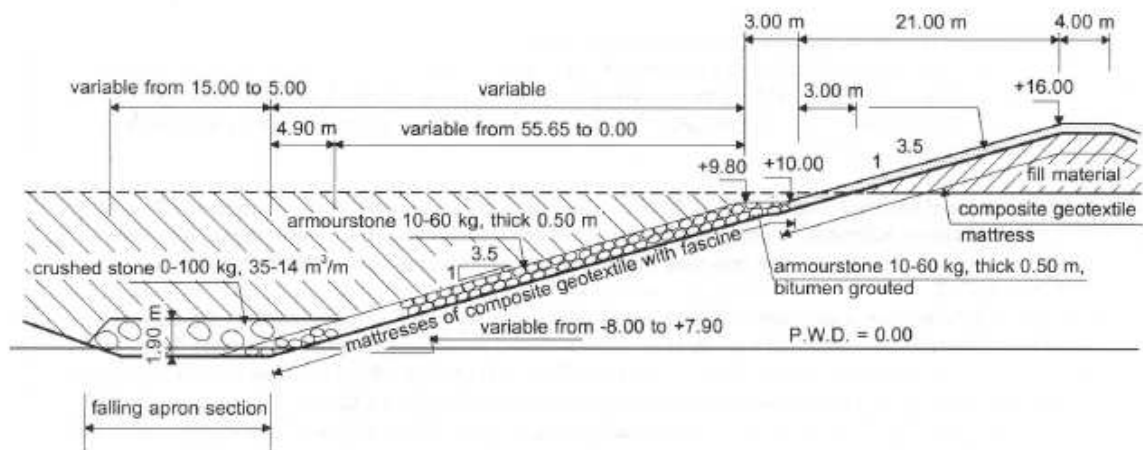


Figure 8.27

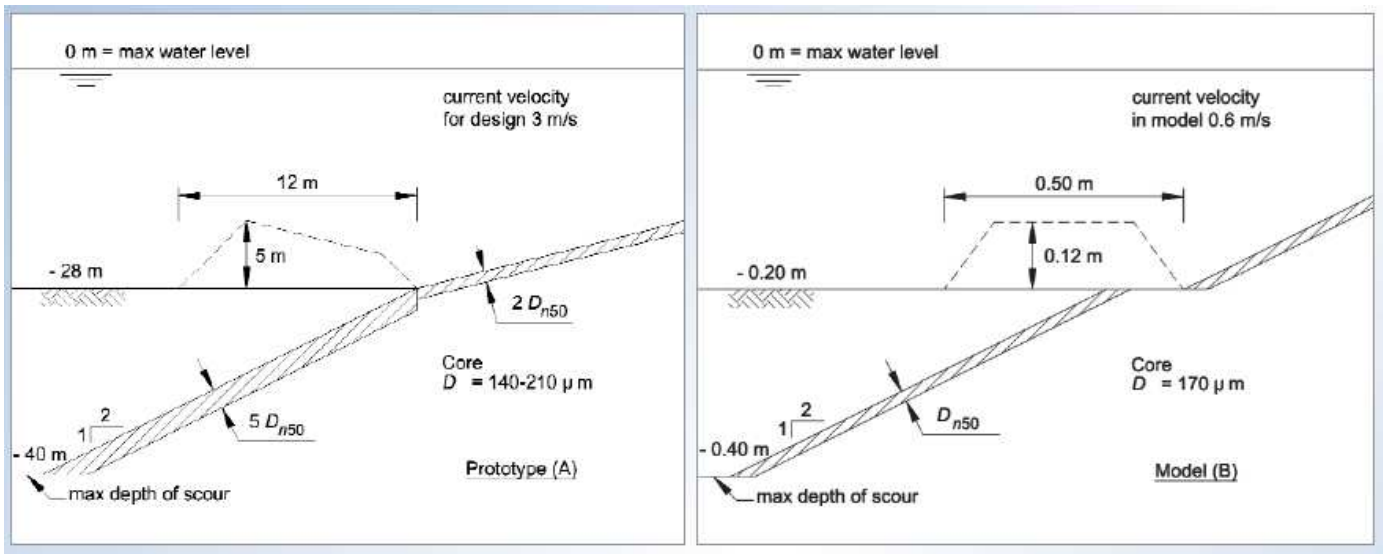


Figure 8.28

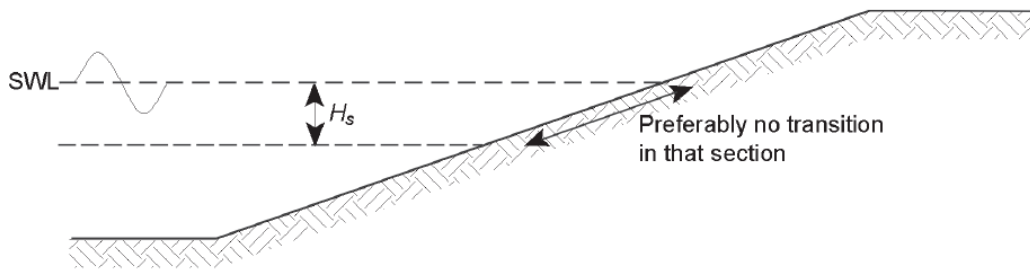


Figure 8.31

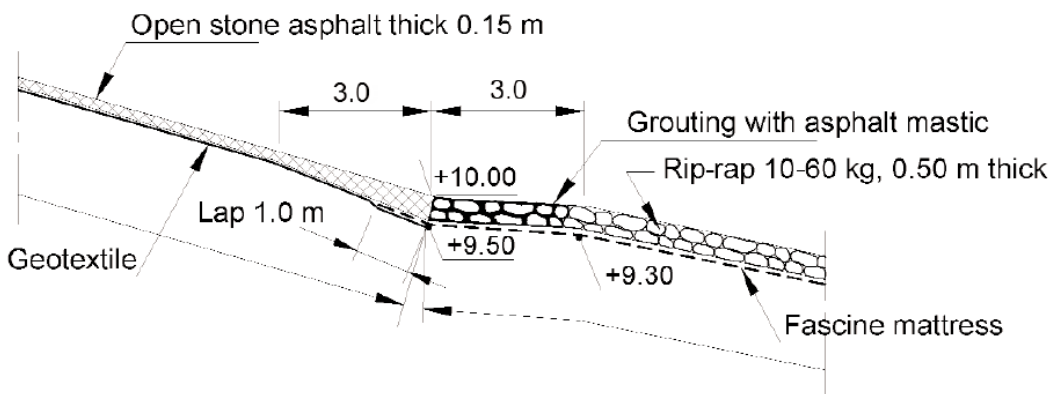


Figure 8.32

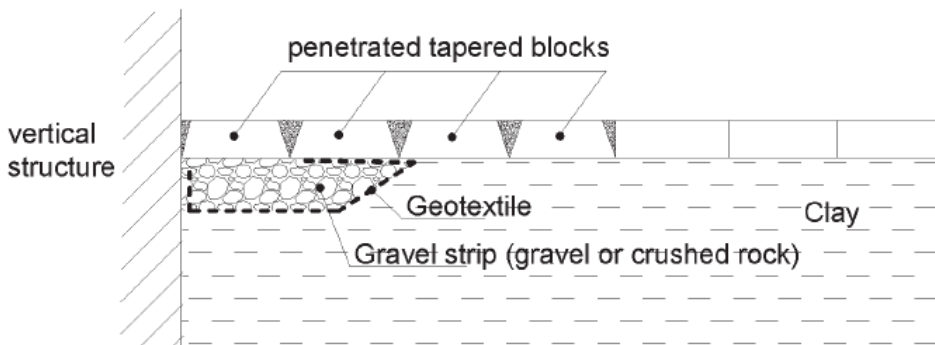


Figure 8.39

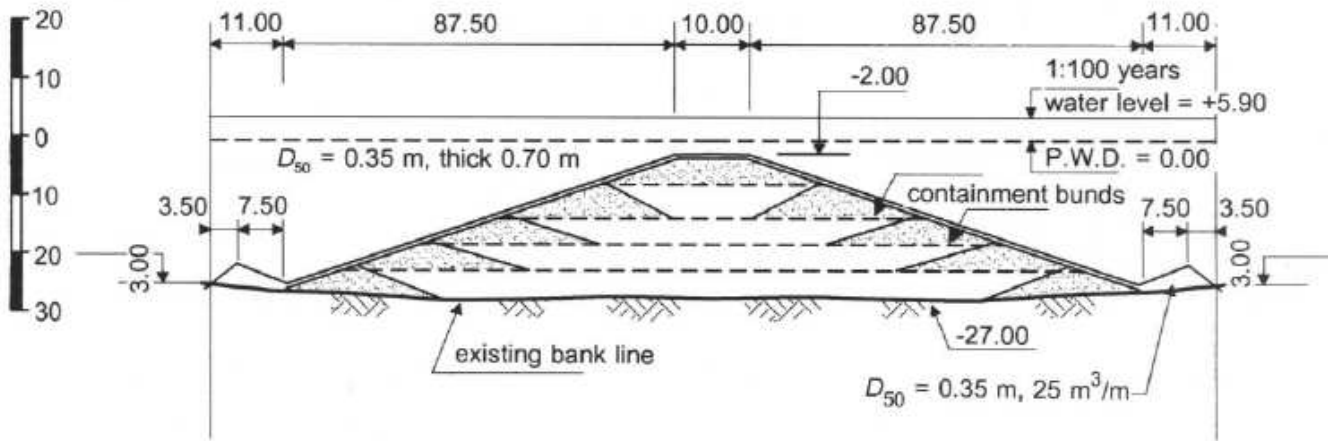


Figure 8.41

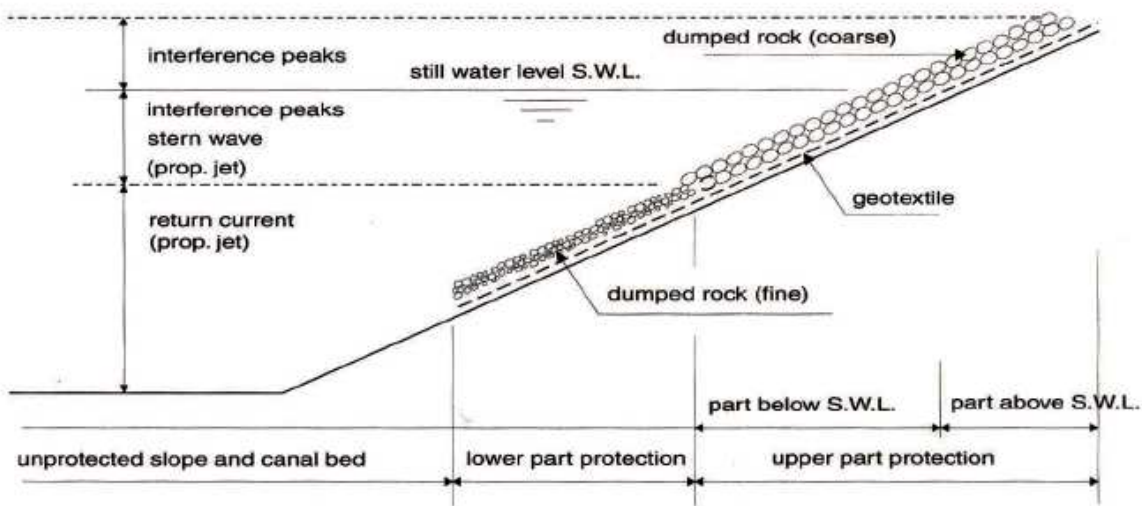


Figure 8.42

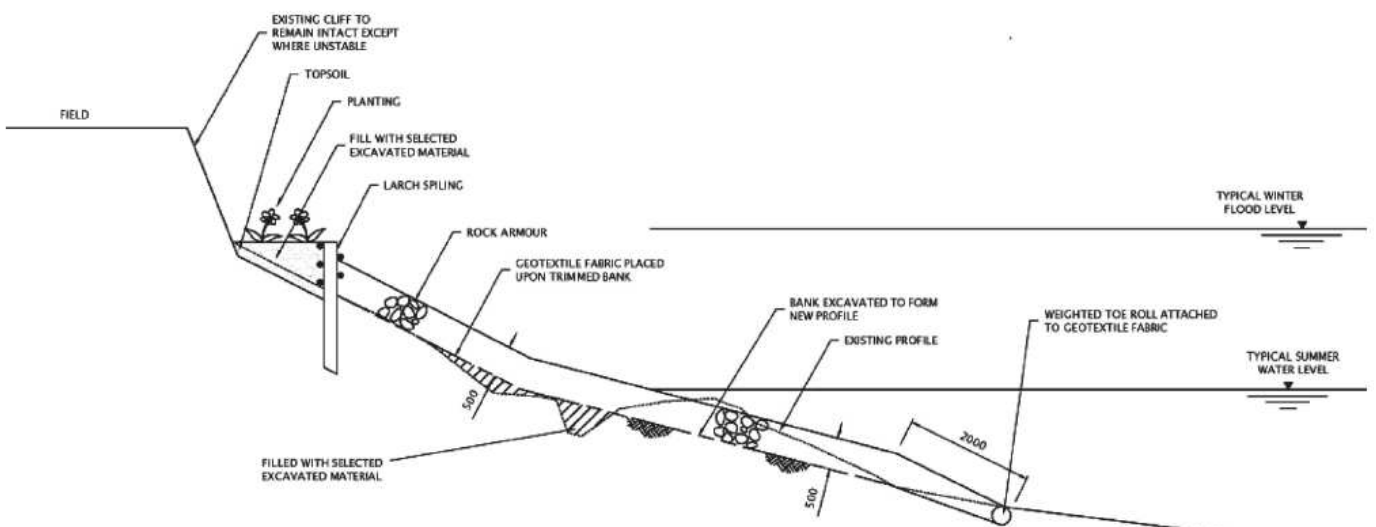


Figure 8.45

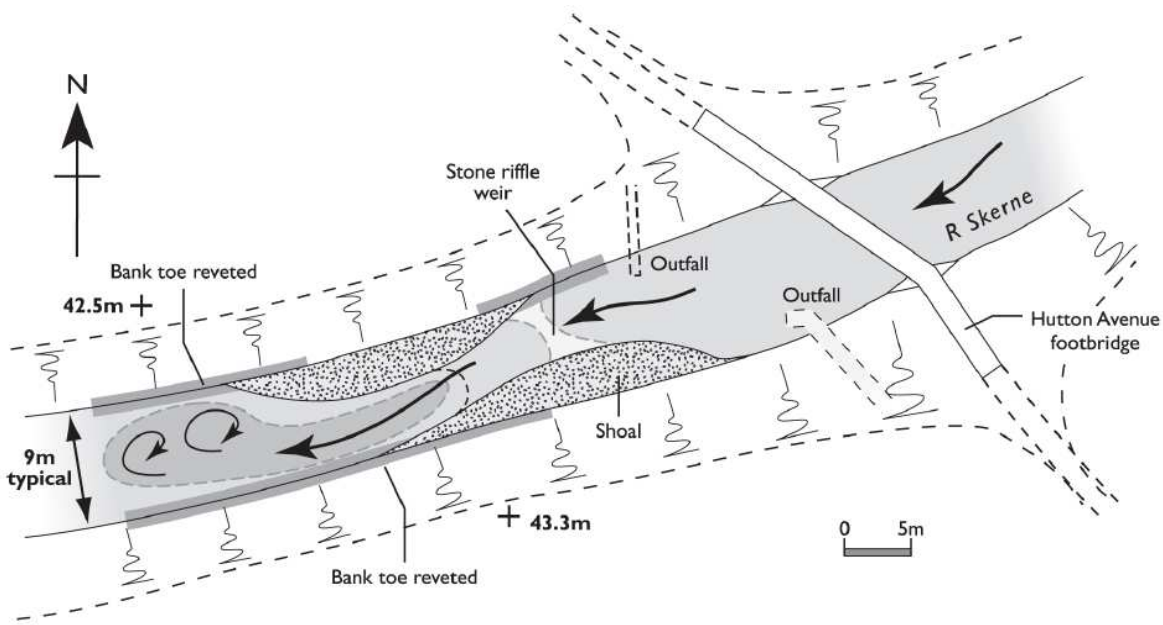


Figure 8.46

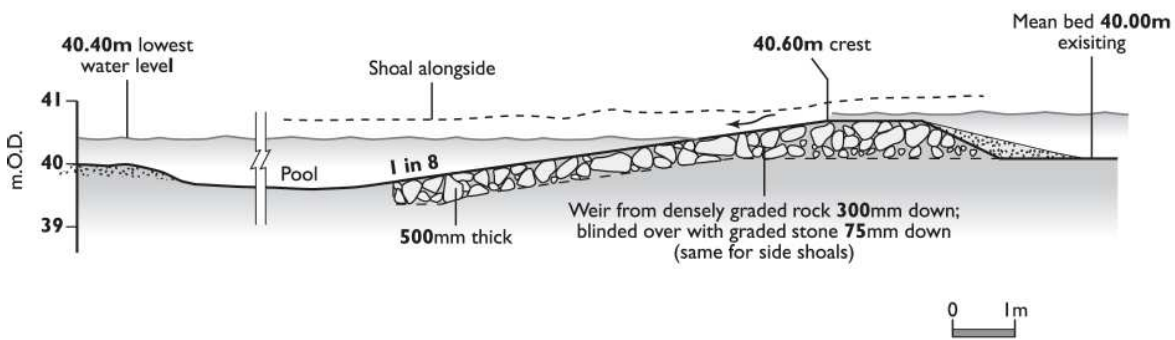


Figure 8.47

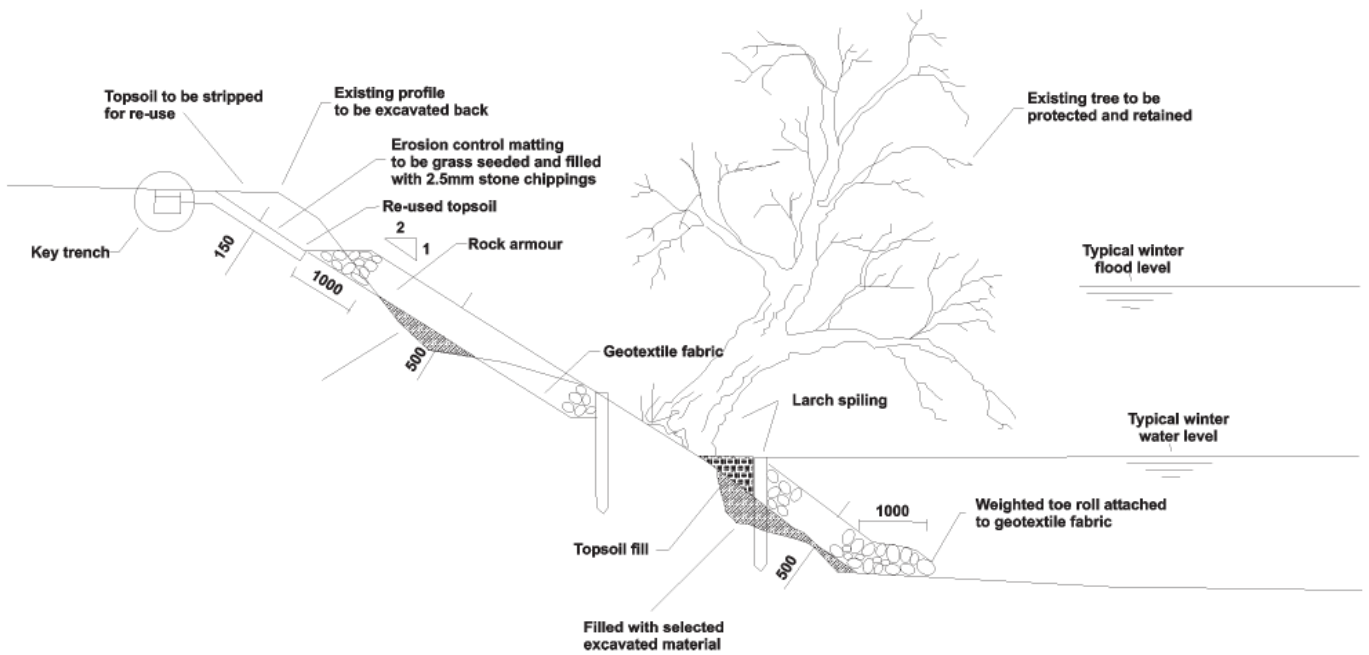


Figure 8.48



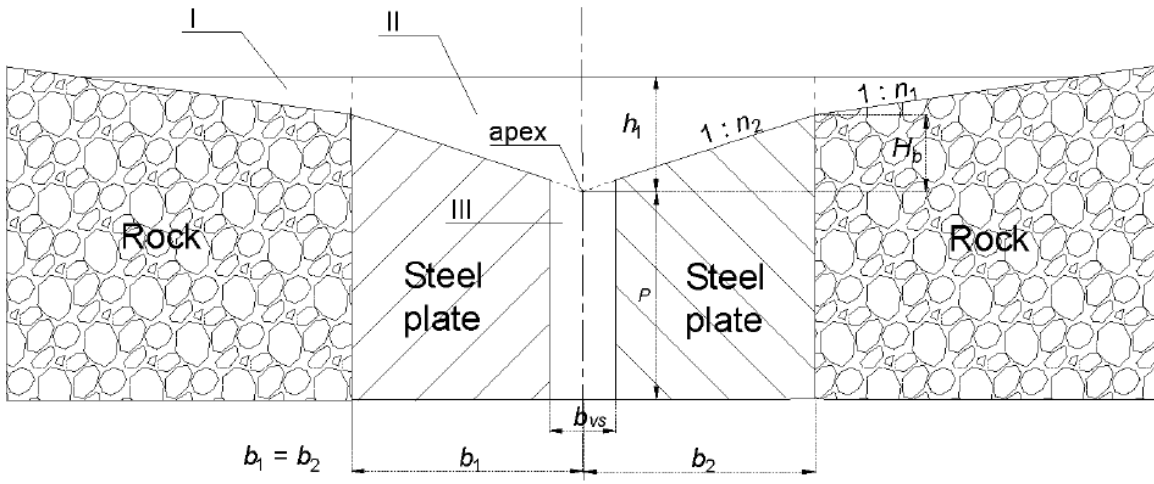


Figure 8.50

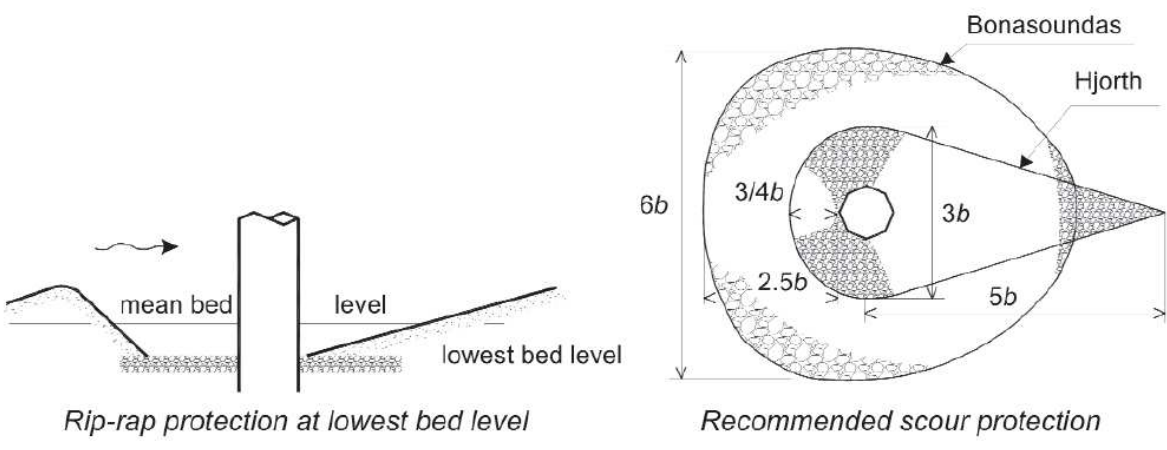


Figure 8.51

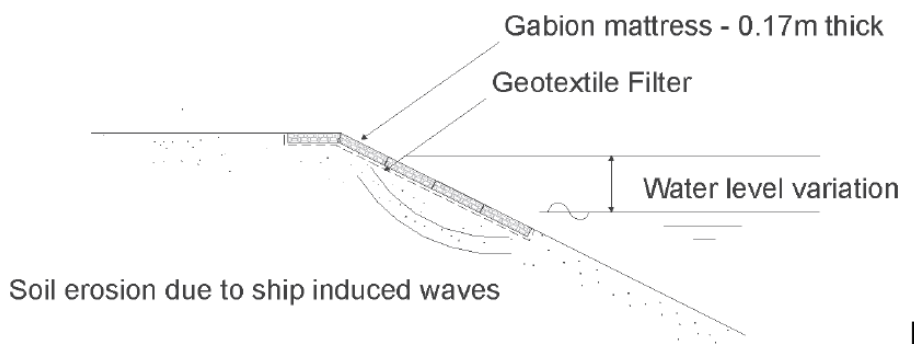
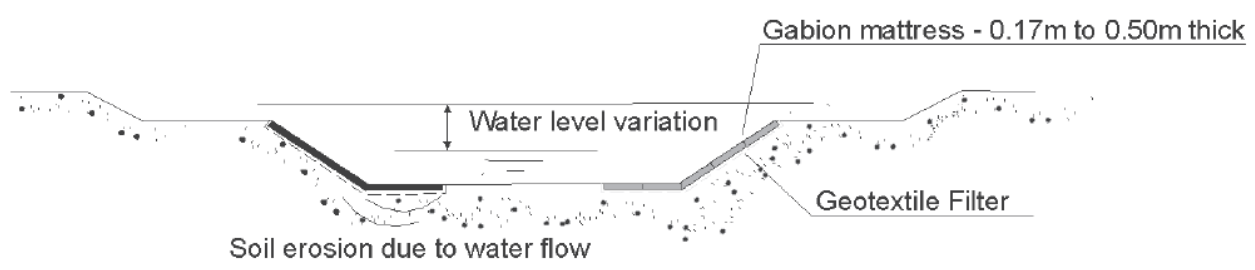


Figure 8.52



Figure

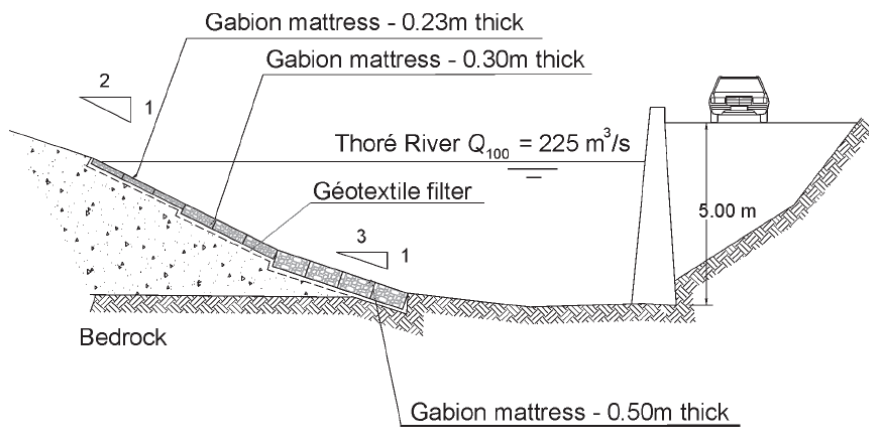


Figure 8.54

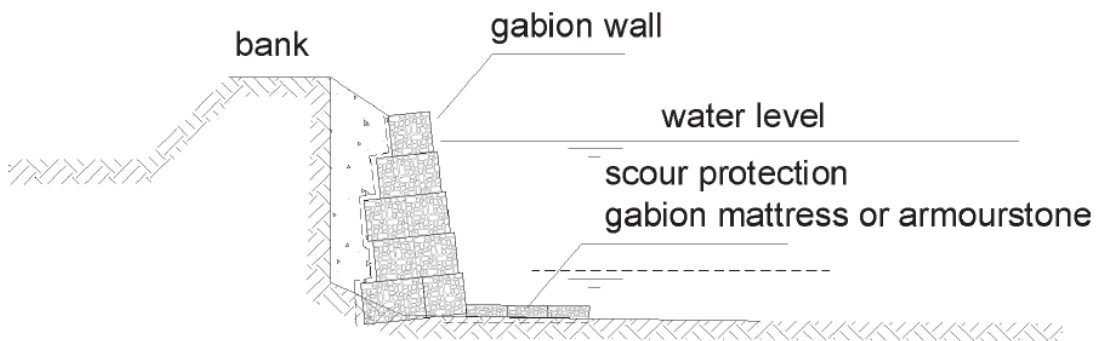


Figure 8.55

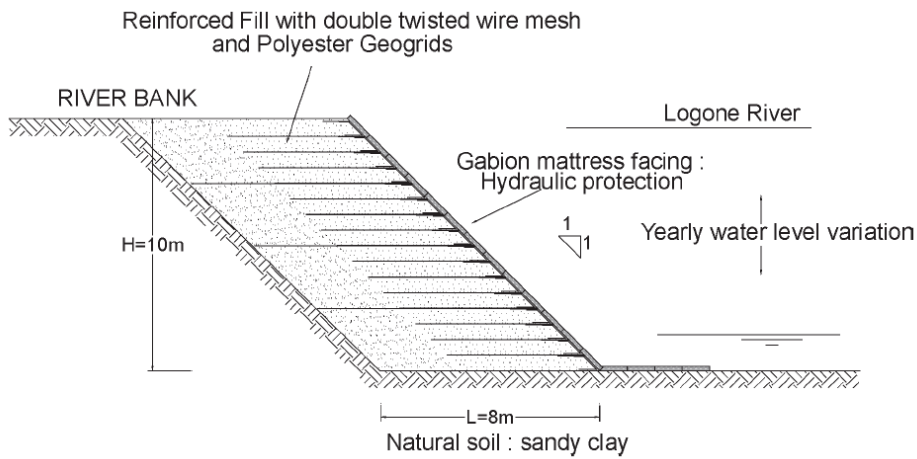


Figure 8.56

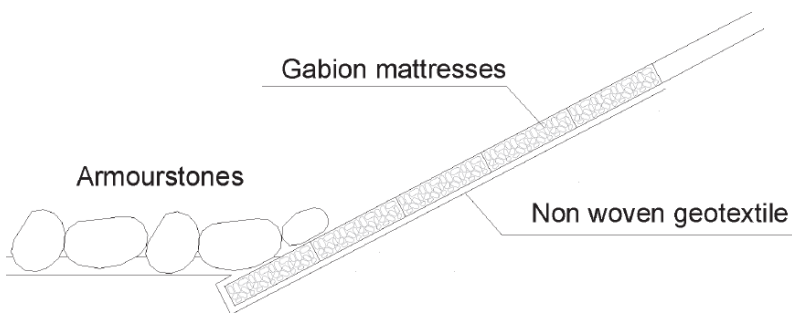


Figure 8.57

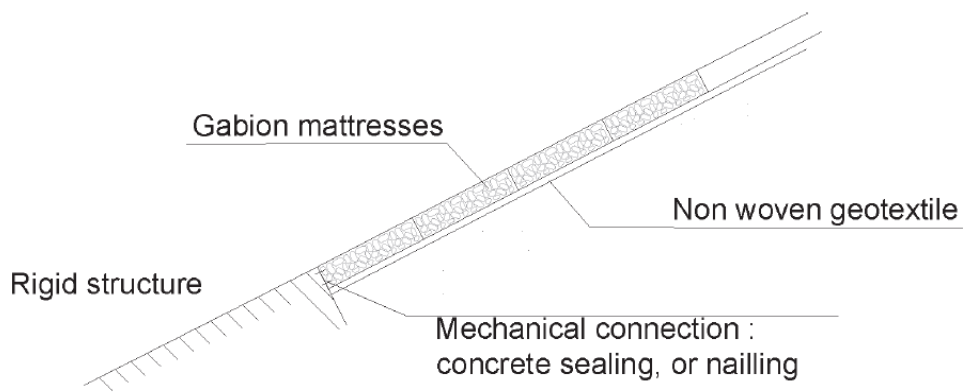


Figure 8.58

Figures of Chapter 9:

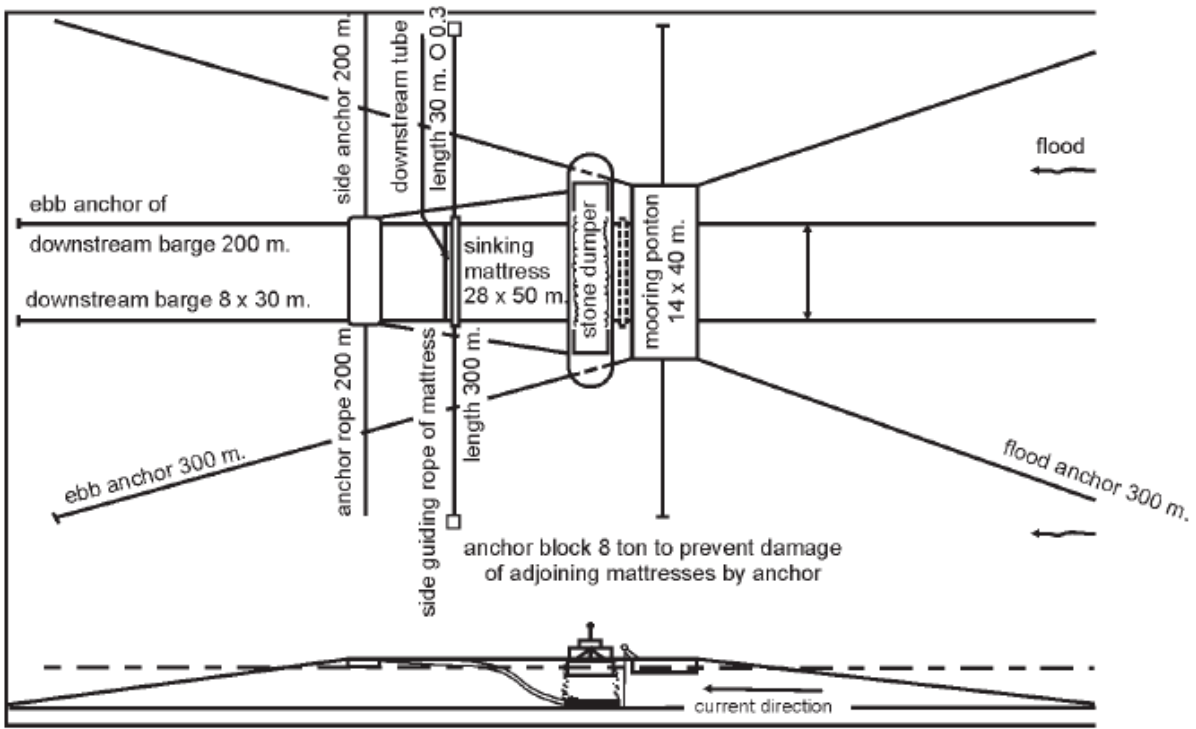


Figure 9.44

Figures of Chapter 10:

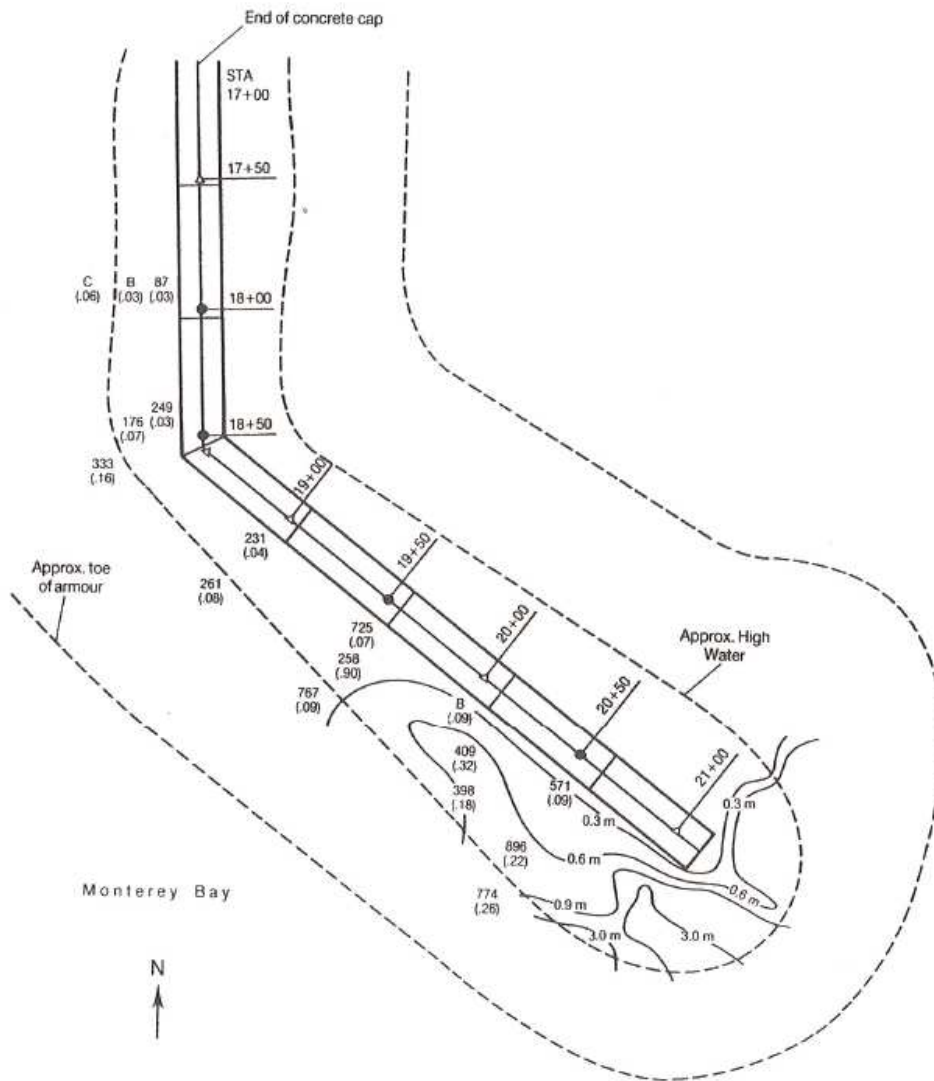


Figure 10.8

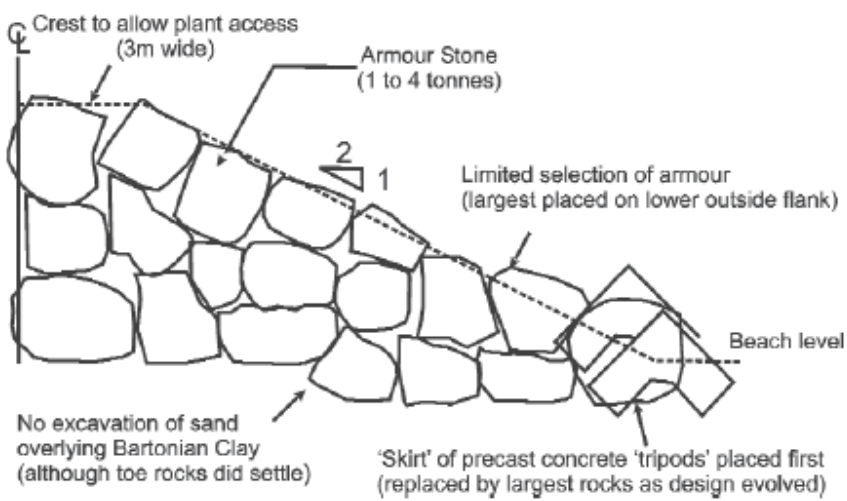
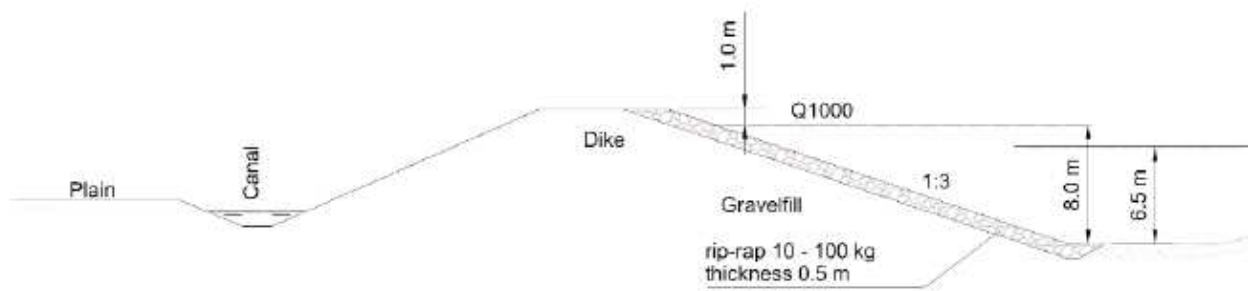
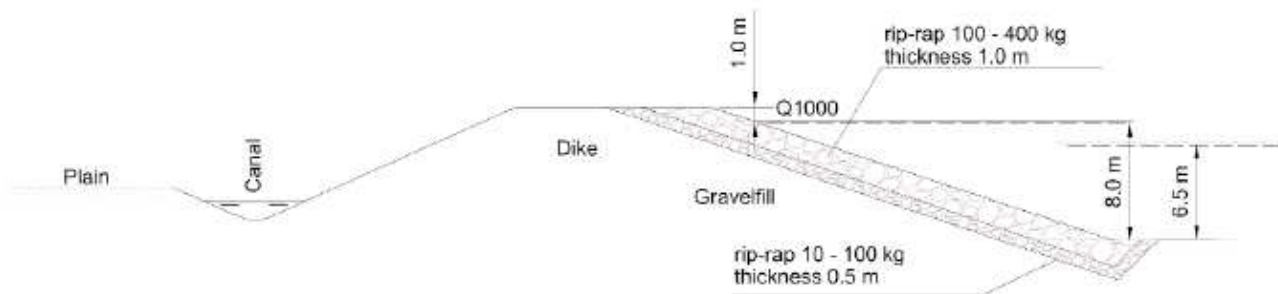


Figure 10.17



Normal exposure



High exposure

Figure 10.20