

Chapter 17: Review



ct5308 Breakwaters and Closure Dams

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Emergency closure at Westkapelle
1944 (photo: National Geographic)

1

advantages and disadvantages

rubble mound

- simple construction
- withstand unequal settlement
- large ratio between initial damage and collapse
- many guidelines available
- dependence on the availability of adequate quarry
- large quantity of material required in deep water
- large space required
- difficult to use as quay wall

monolithic

- short construction time on location
- can function as quay wall
- economical use of material in deeper water
- sensitivity to poor foundation conditions
- uncertainty about wave loads in breaking waves
- complete and sudden failure when overloaded
- reflection against vertical wall
- limited support for the designer from guidelines and literature

Quarry stone or concrete ??



March 28, 2012

3

which design formula ???

$$W \geq \frac{N \rho_r g H^3}{\Delta^3 (\mu \cos \alpha + \sin \alpha)^3}$$

$$W \geq \frac{\rho_r g H^3}{\Delta^3 K_D \cot \alpha}$$

$$\frac{H_{sc}}{\Delta d_{n50}} = 6.2 P^{0.18} \left(\frac{S}{\sqrt{N}} \right)^{0.2} \xi^{-0.5} \quad (\text{plunging breakers})$$

$$\frac{H_{sc}}{\Delta d_{n50}} = 1.0 P^{-0.13} \left(\frac{S}{\sqrt{N}} \right)^{0.2} \xi^P \sqrt{\cot \alpha} \quad (\text{surging breakers})$$

SLS and ULS

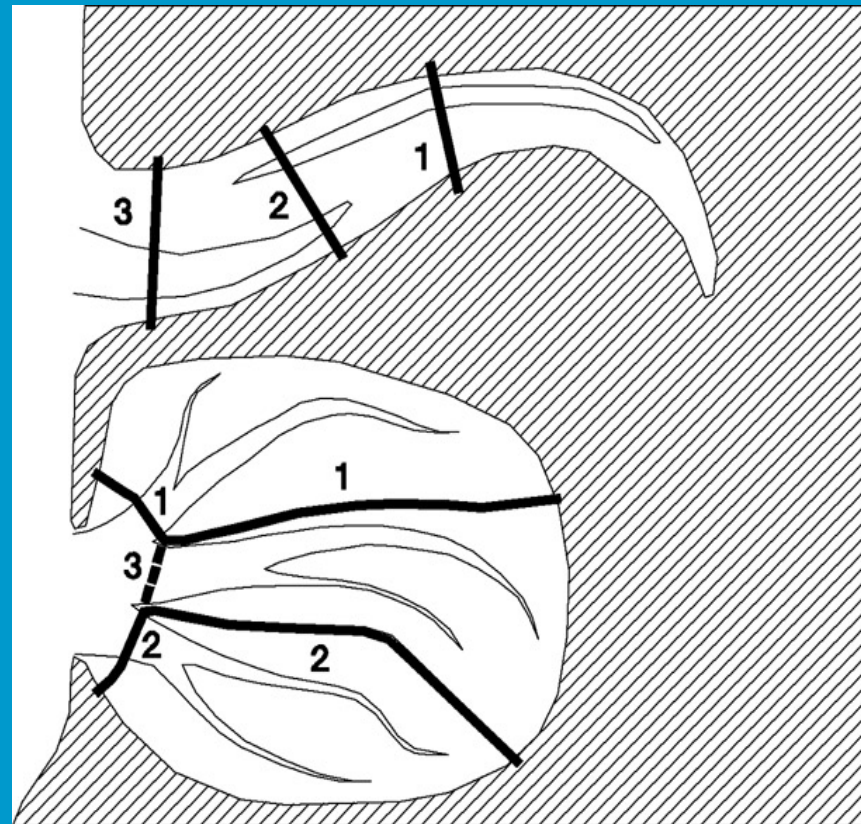
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5

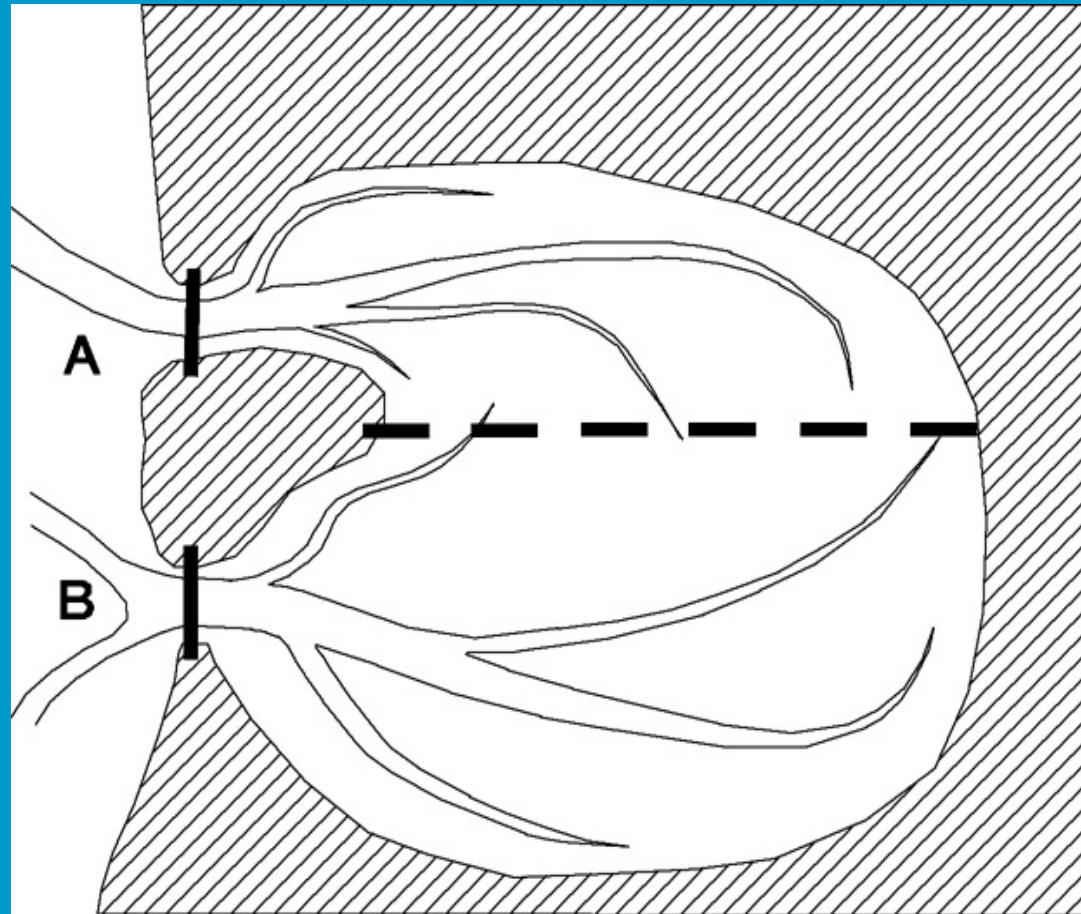
Closure dams: special conditions

- subdivision of the basin in order to reduce storage area
- subdivision because of two entrances
- a closure with two or more entrances

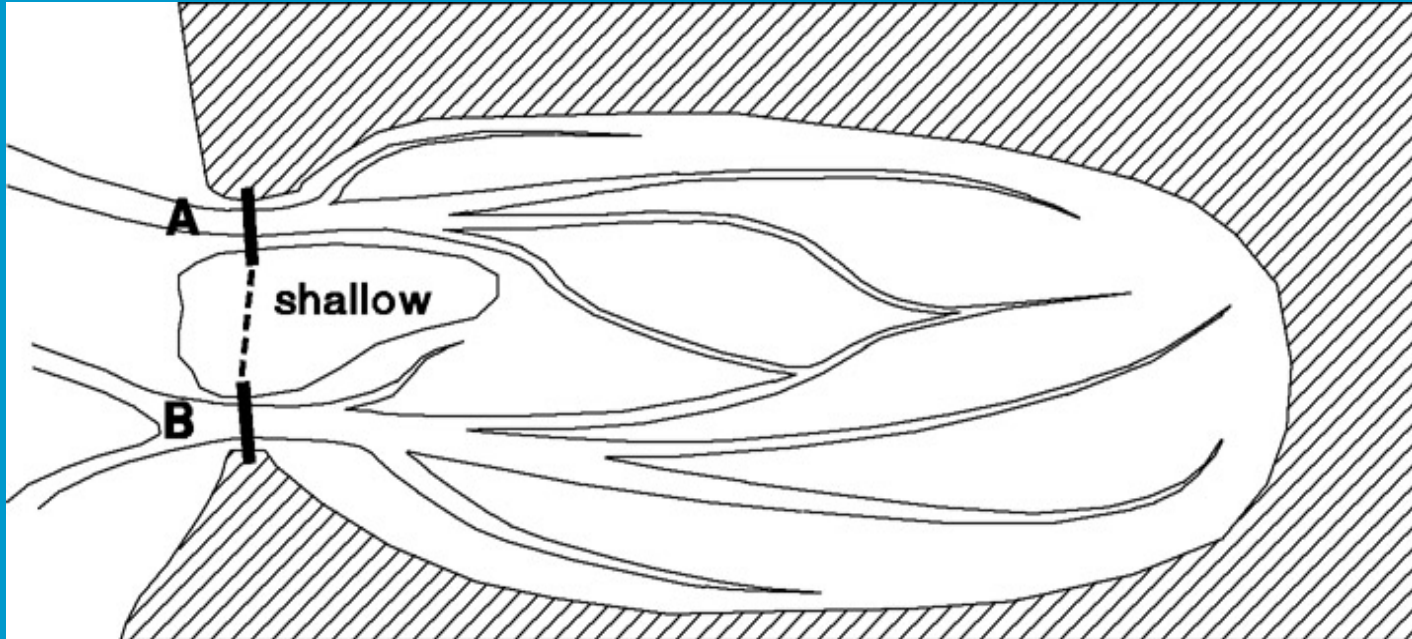
two ways to reduce the area of a basin



a basin with two entrances

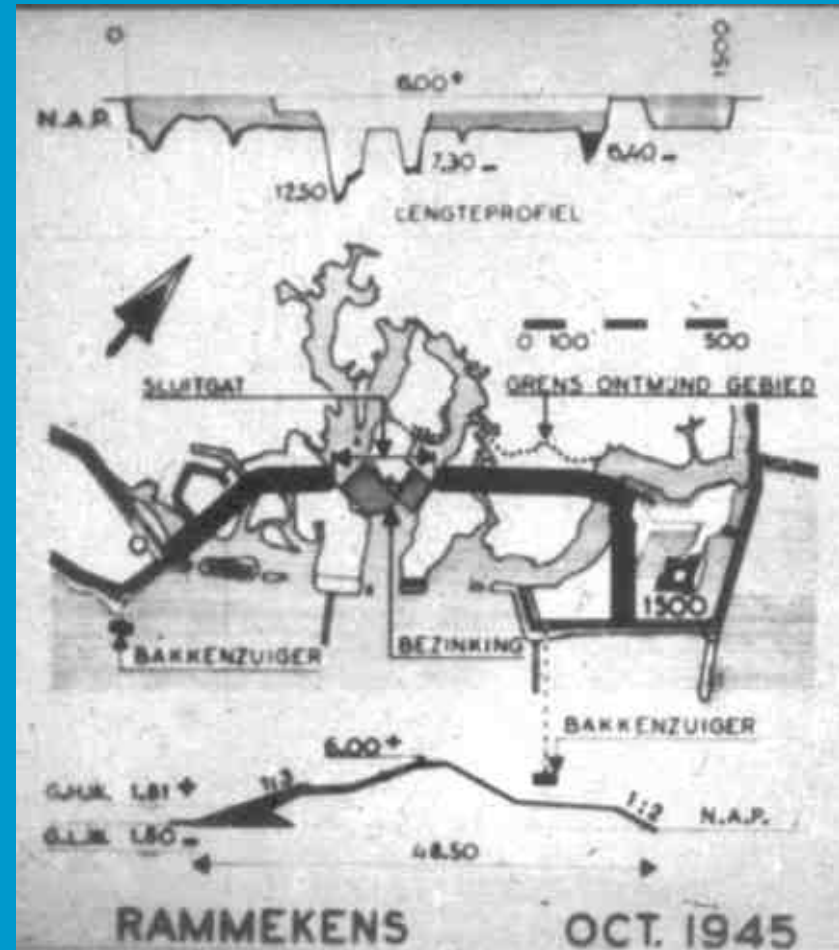


an estuary with two channels

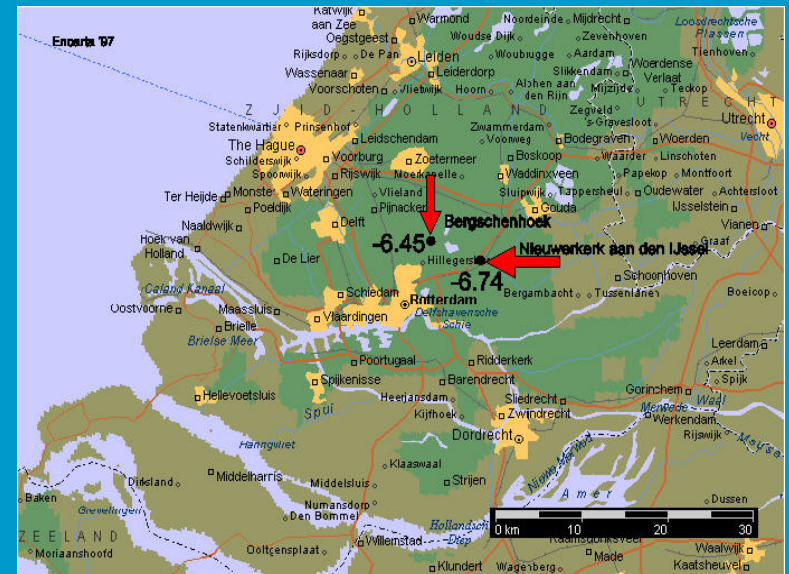


The gap is not (yet) in equilibrium

- stabilise the bottom of the gap as soon as possible
- avoid erosion of gullies in the storage area



closure dike breach Ouderkerk aan den IJssel (1953)



March 28, 2012

11

closure alignments

