Irrigation and Drainage Engineering

(Soil Water Regime Management)

(ENV-549, A.Y. 2024-25)

4ETCS, Master option

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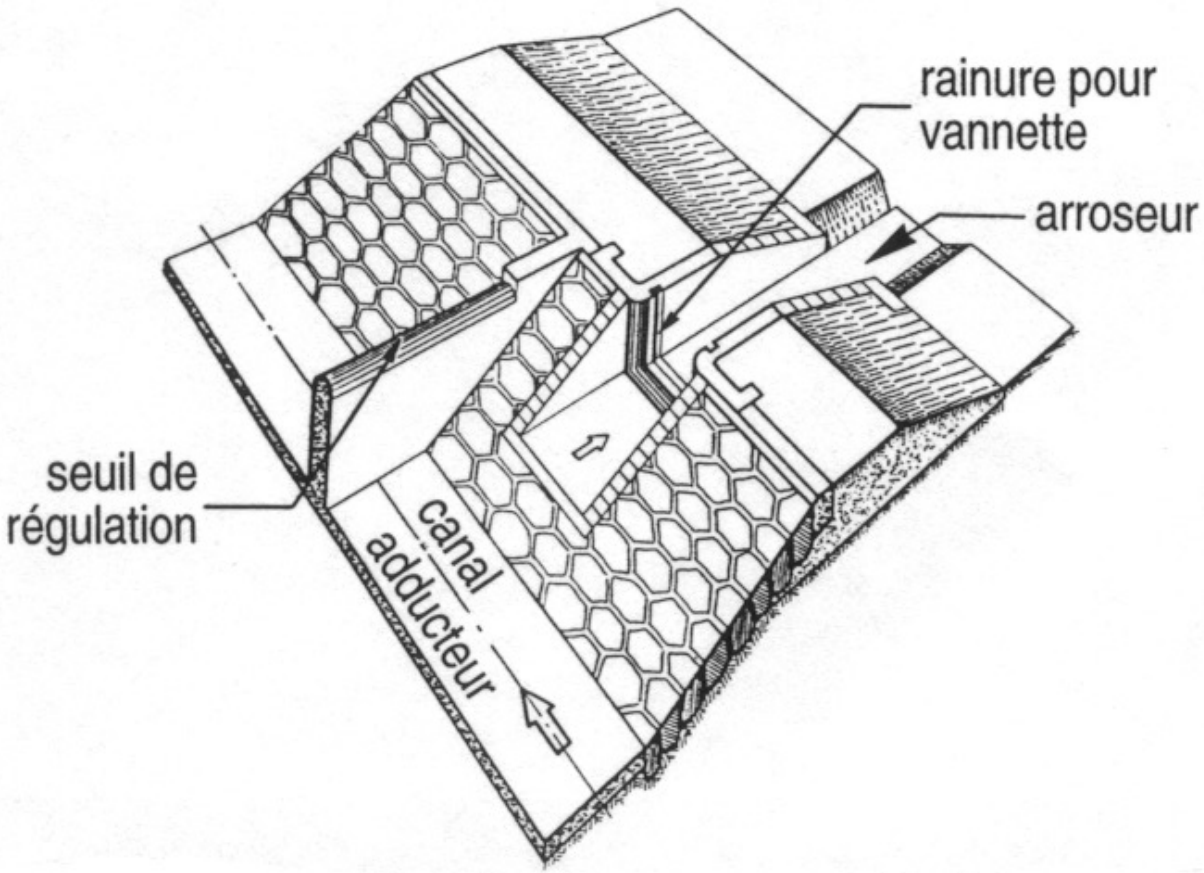
Platform of Hydraulic Constructions

Lecture 3.2. Surface irrigation: redistribution structures

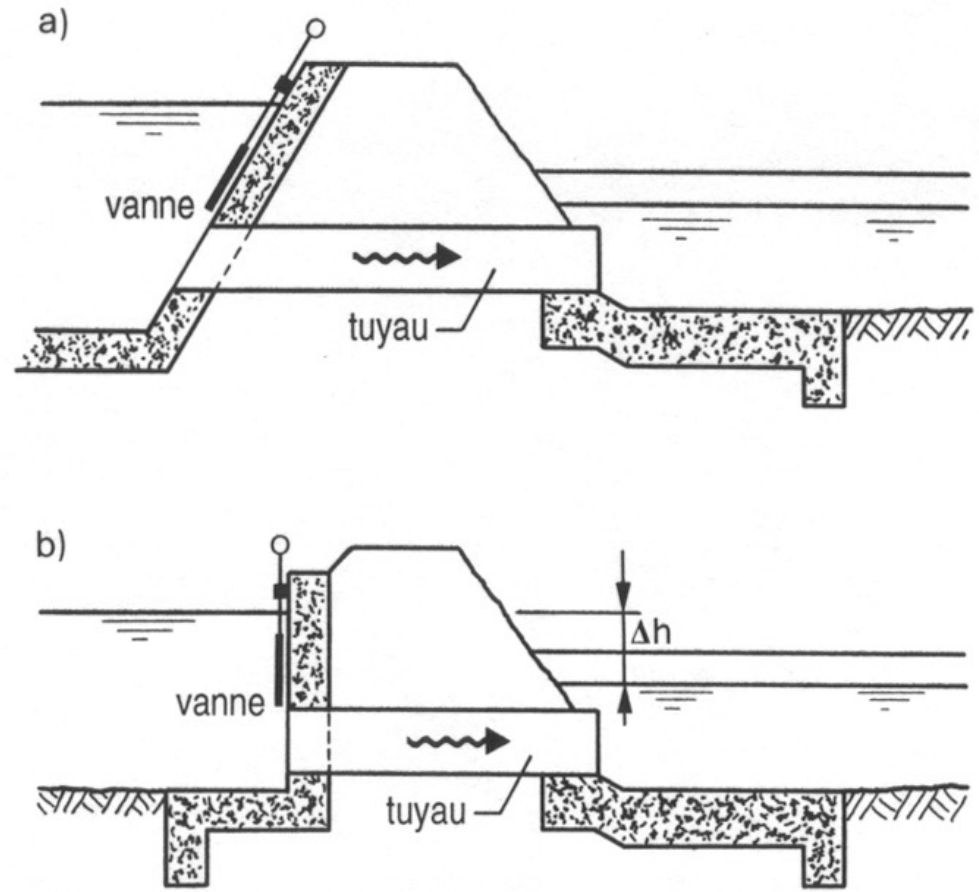
Water (re)distribution structures

Hydraulic structures installed at the head of canals and whose function is to divert part of the flow of the adductor canal according to :

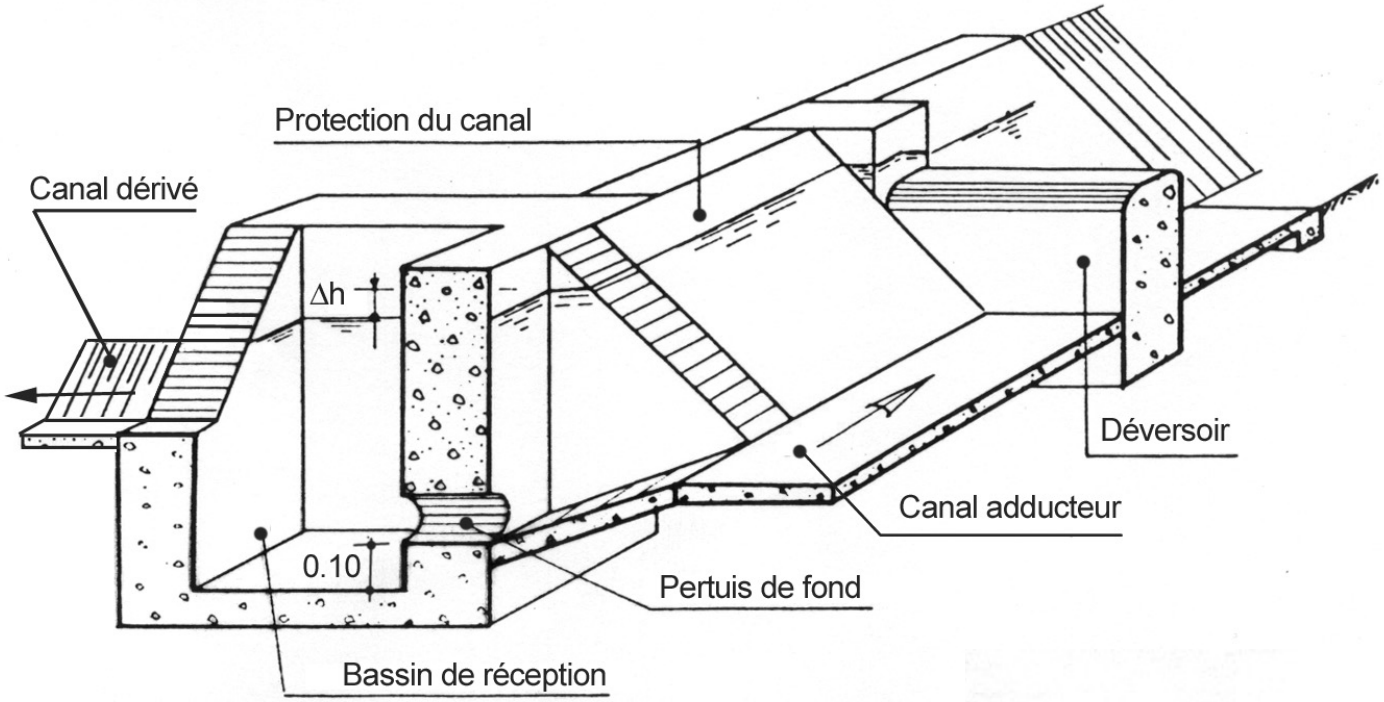
- a given flow rate
- a given ratio (proportional distribution)



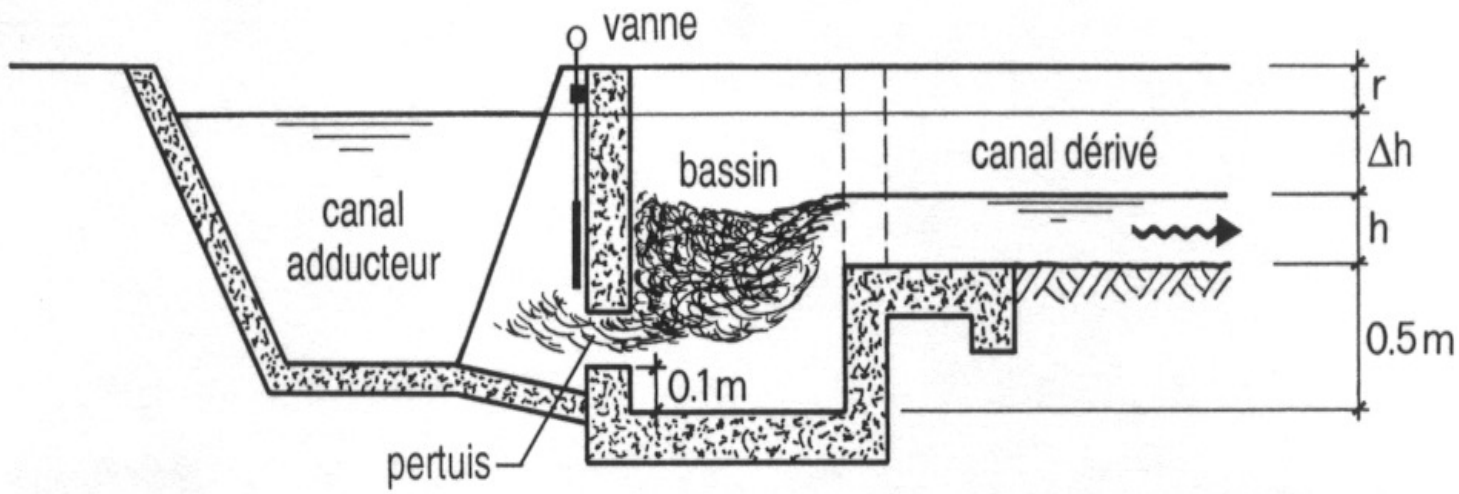
Surface weir intake

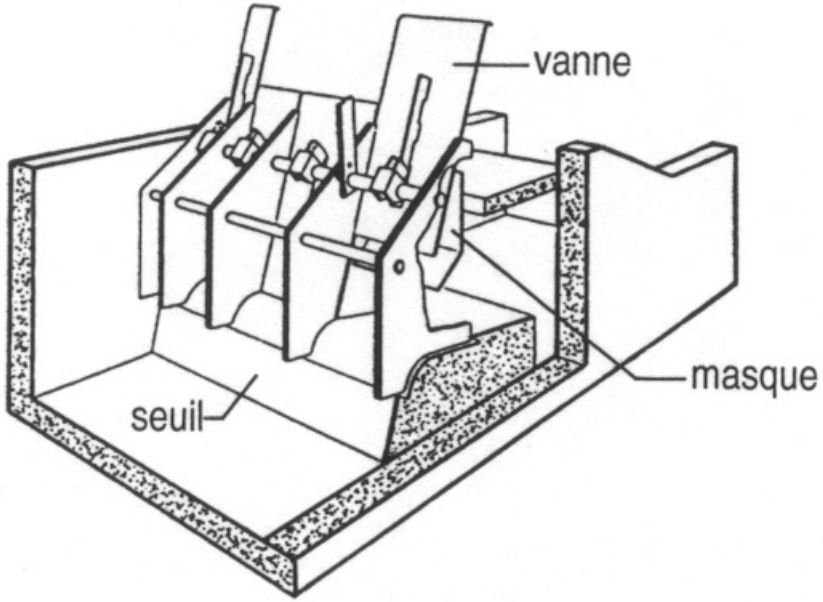


Orifice type intake

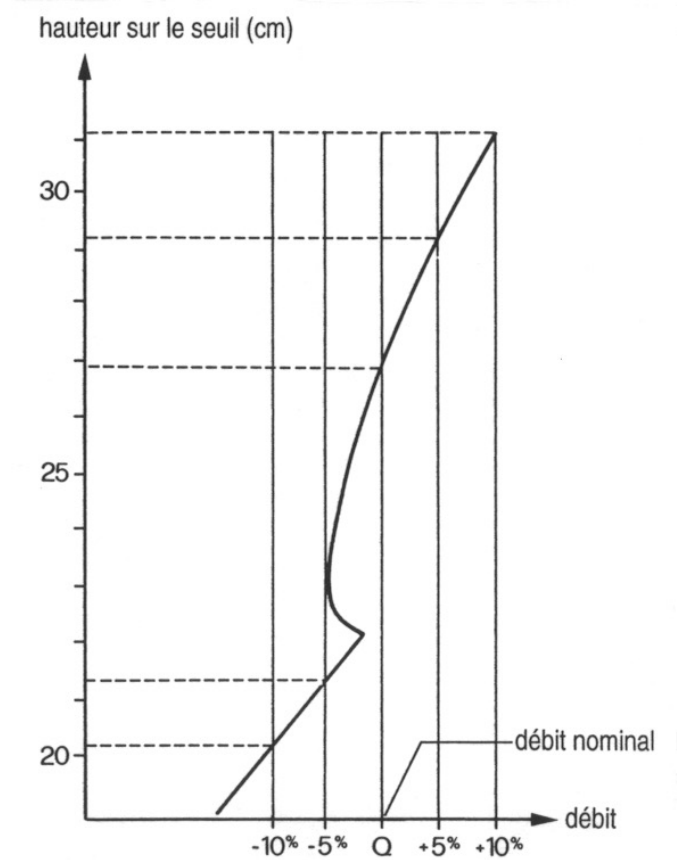


Bottom orifice





Mask module



Campus

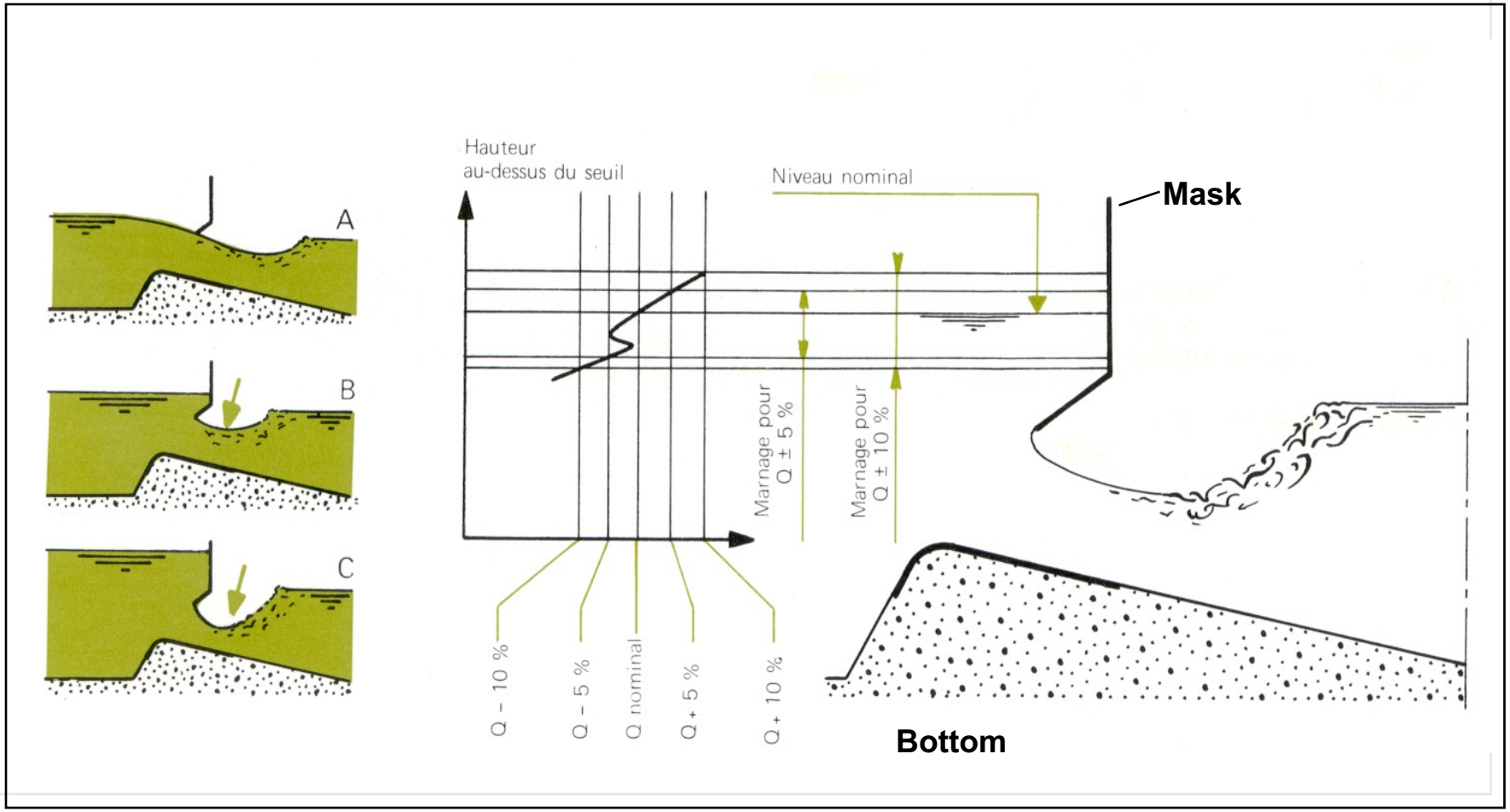
Field

Campus

Field

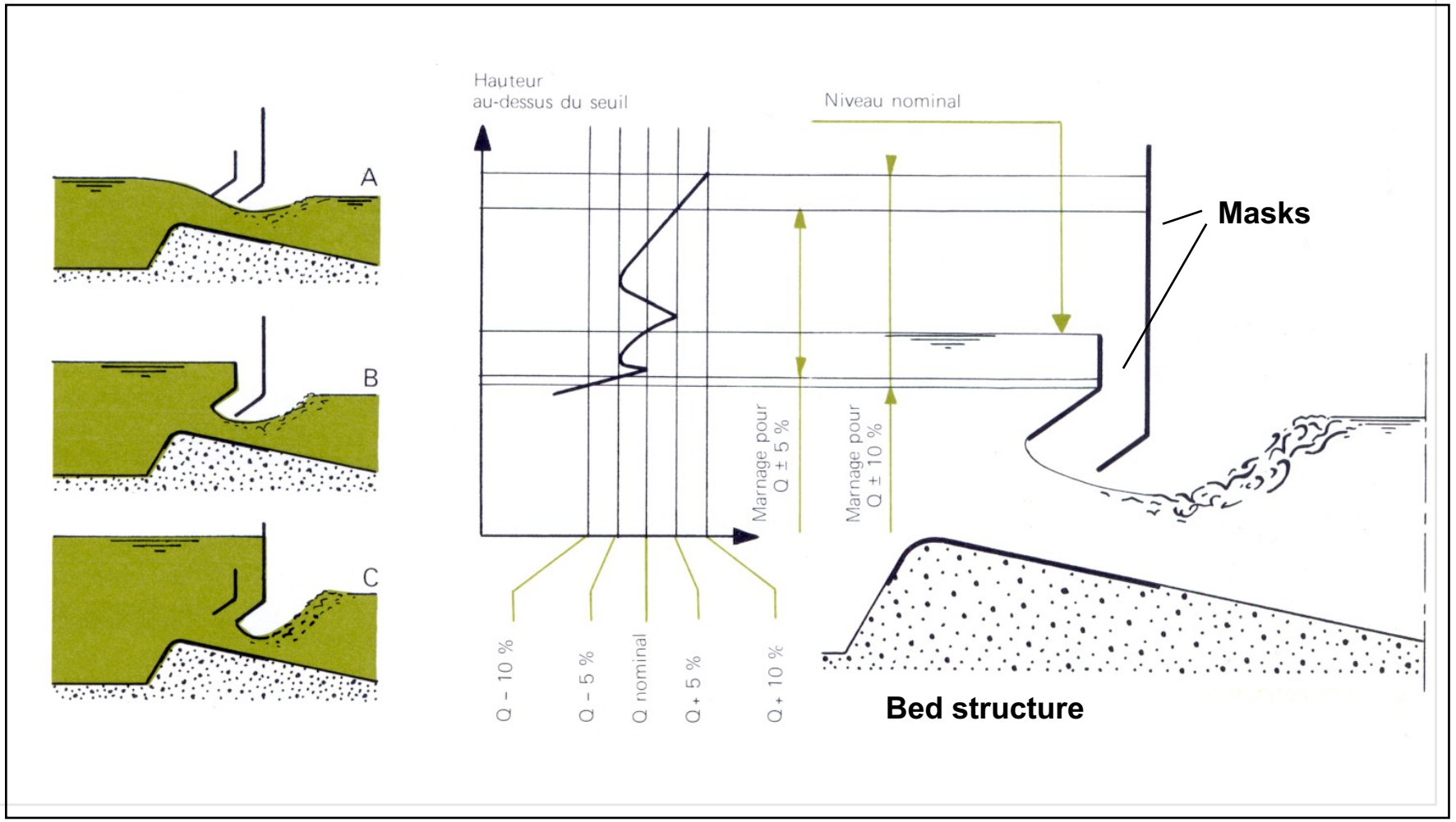
Notice the possibility to combine several gate apertures by which means the total flow is simply the sum thanks to the constant water level upstream (e.g., mantained by a control structure)

Schematic diagram and operating curve for a 1-mask module



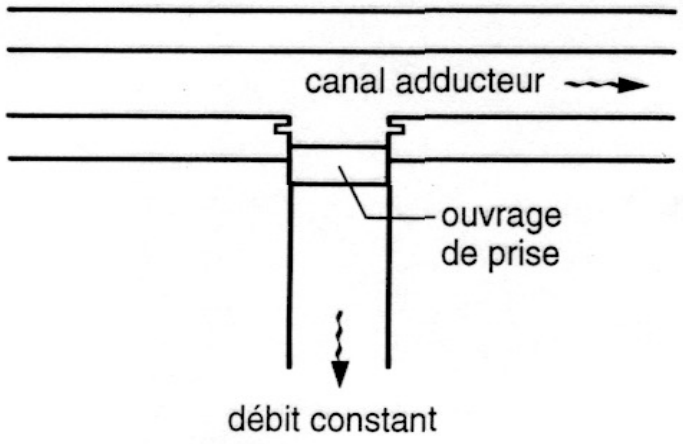
The particular shape of the bed and mask means that when the load increases, the contraction is accentuated, which reduces C and therefore the flow rate.

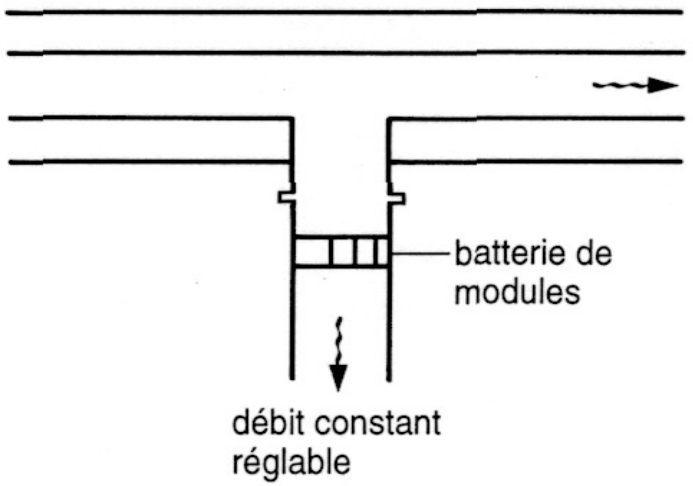
Schematic diagram and operating curve for a 2-mask module



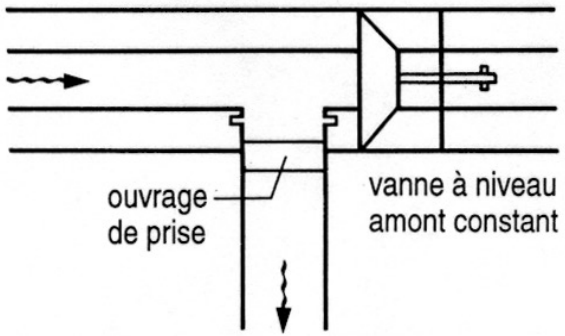
Thanks to the contraction produced by the first mask, the second mask can be brought closer to the threshold, forming an orifice with a reduced cross-section.

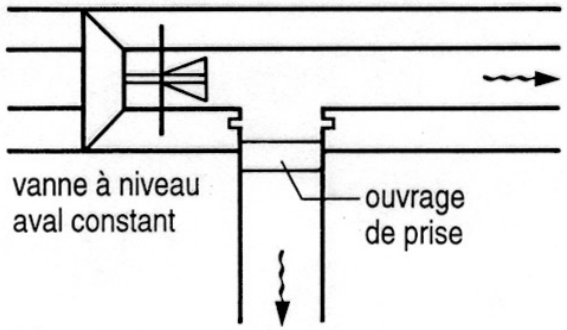
Examples of equipped intakes

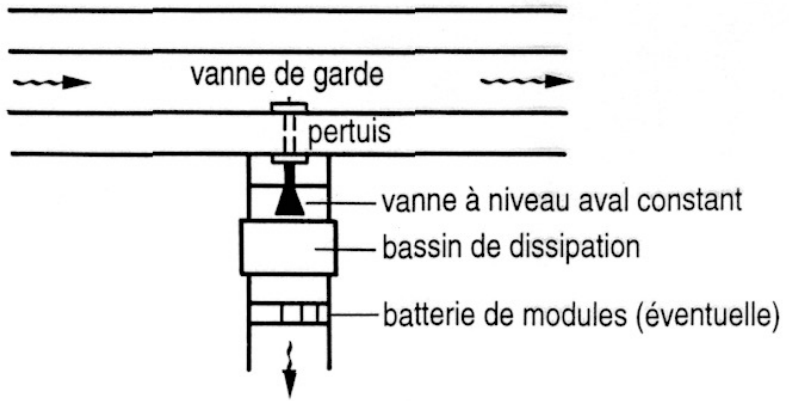




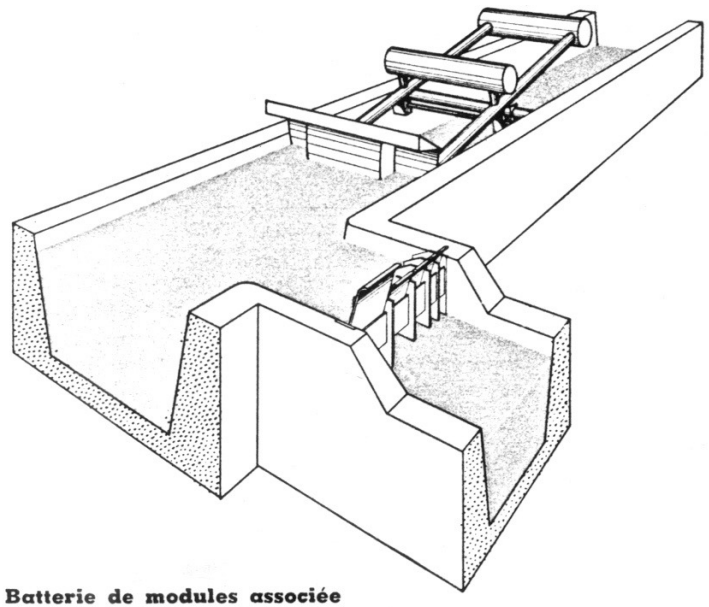
Water level +/- cst in the inlet channel





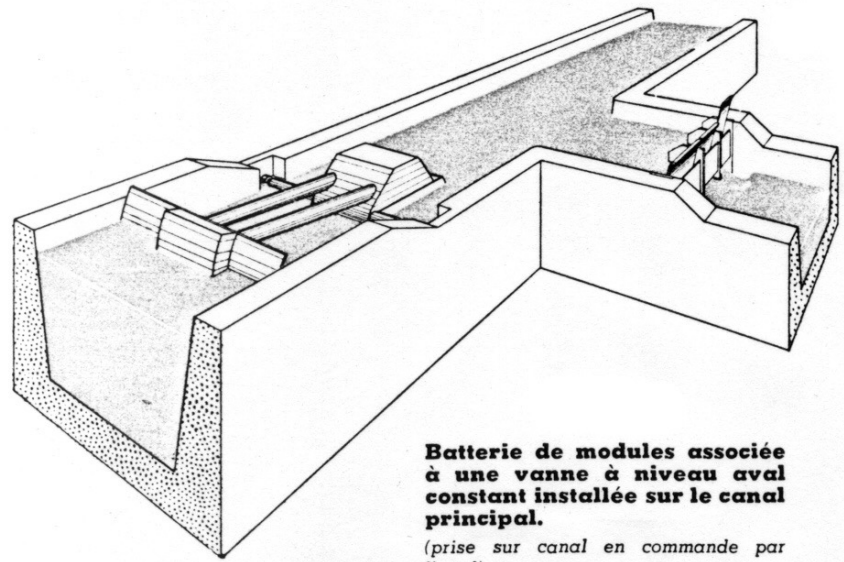


Variable water level in the inlet channel



Batterie de modules associée à une vanne à niveau amont constant installée sur le canal principal.

(prise sur canal en commande par l'amont)

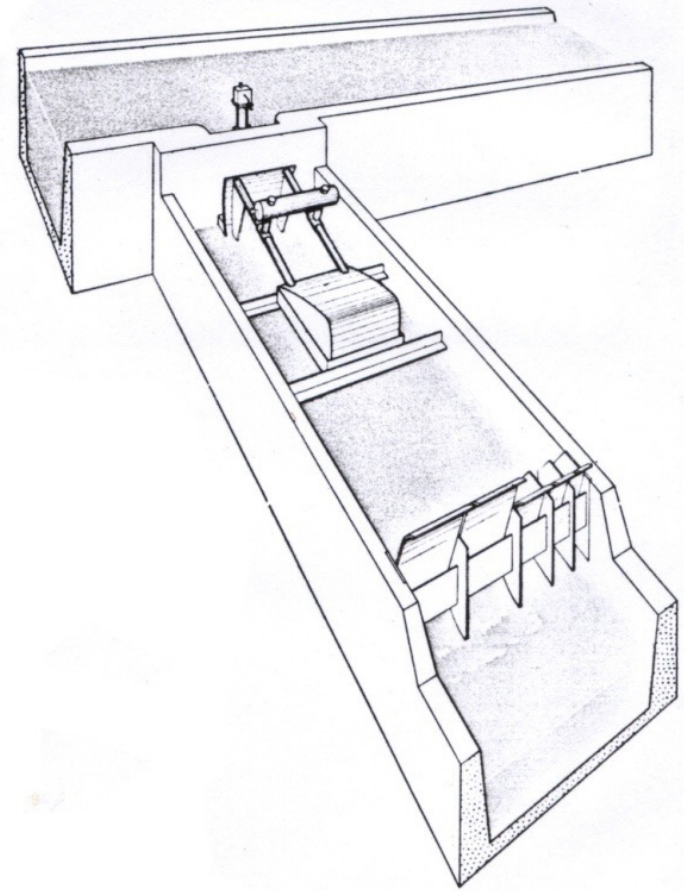


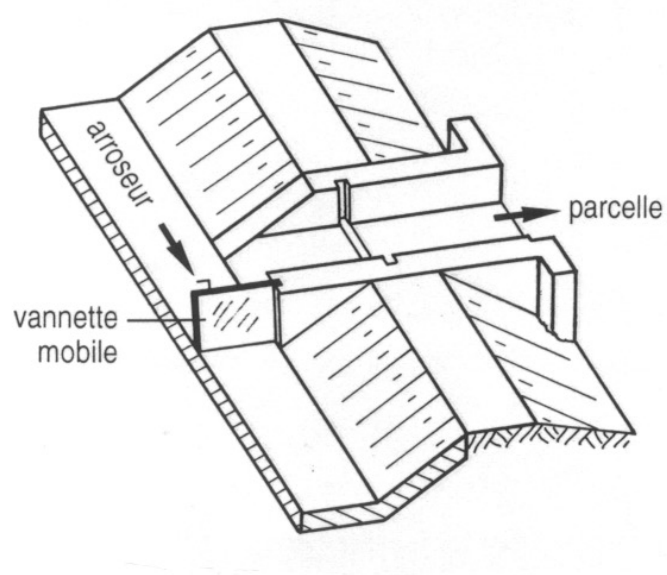
Batterie de modules associée à une vanne à niveau aval constant installée sur le canal principal.

(prise sur canal en commande par l'aval)

Batterie de modules associée à une vanne à niveau aval constant installée en tête d'un canal dérivé.

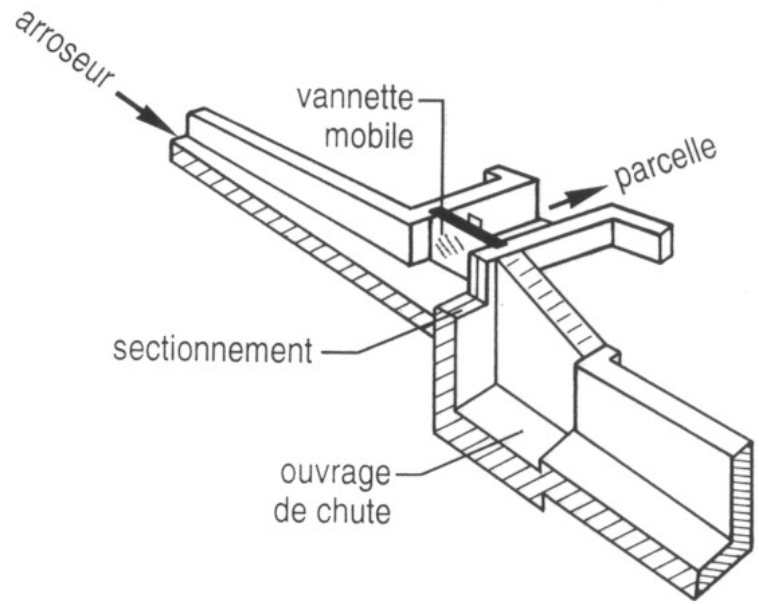
(prise sur canal ou retenue à marnage excédant les tolérances des modules)



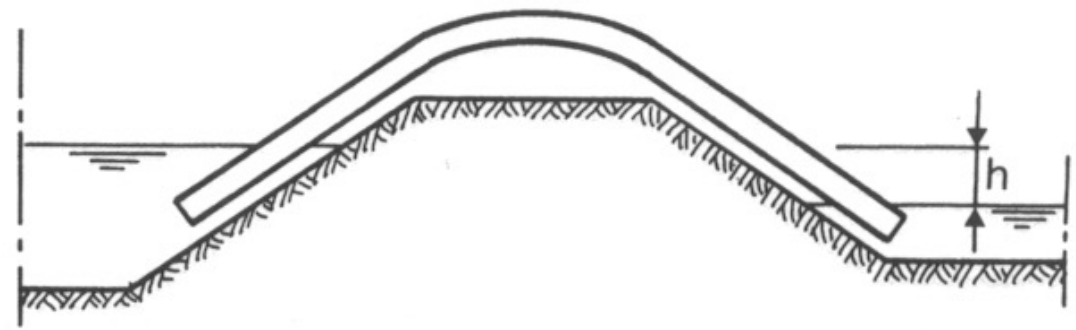


All-or-nothing distribution

Local distribution systems (usually at the plot)

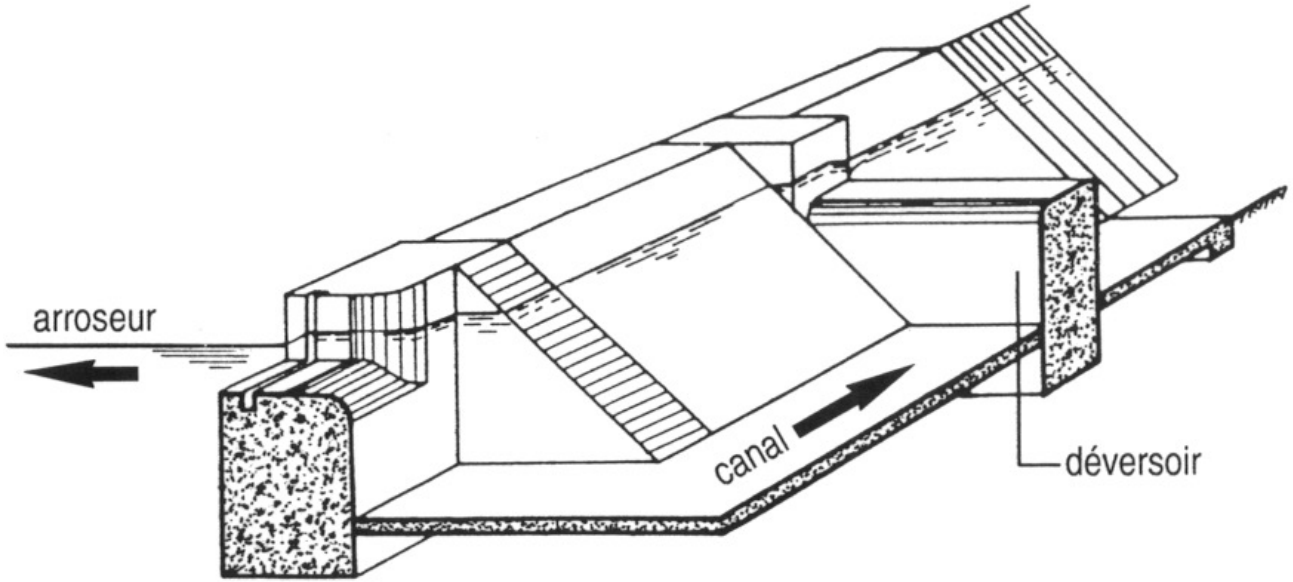


All-or-nothing" distribution with drop

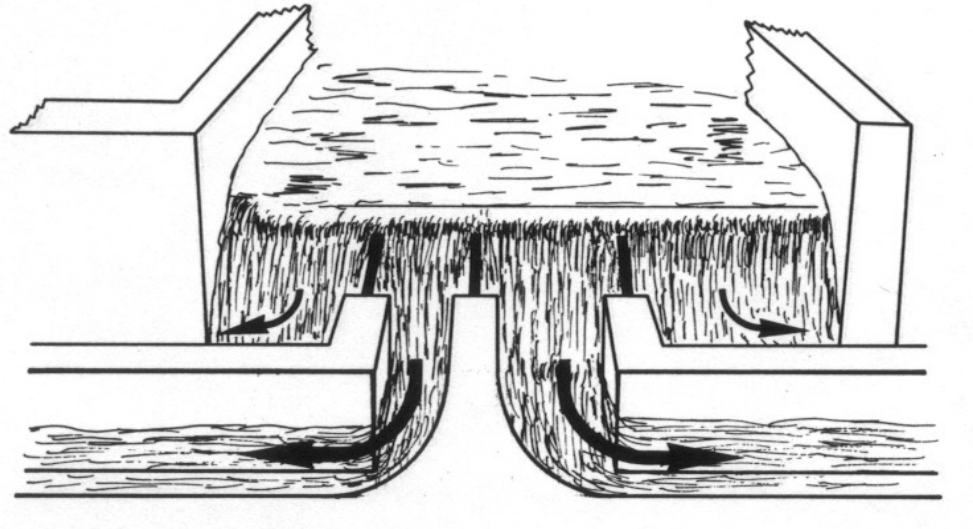


Distribution via syphon

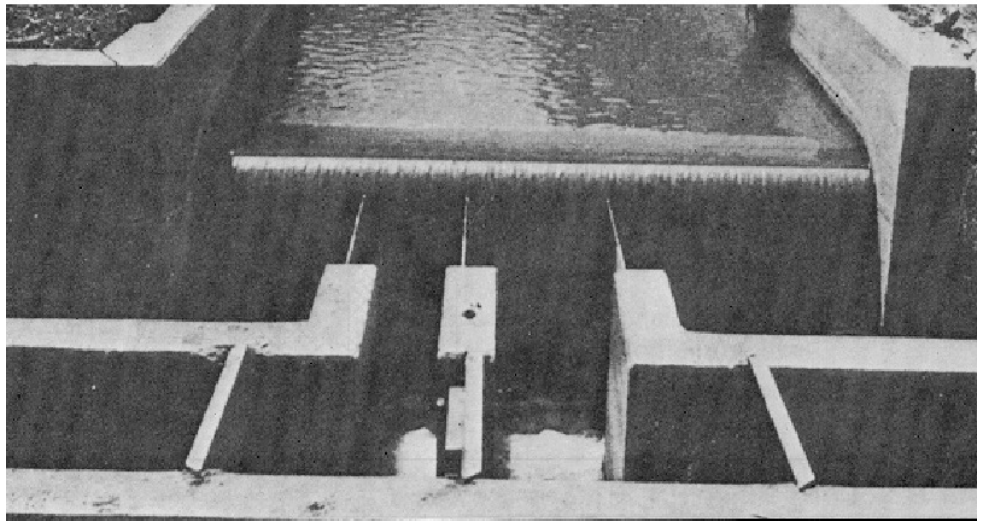
Proportional distribution

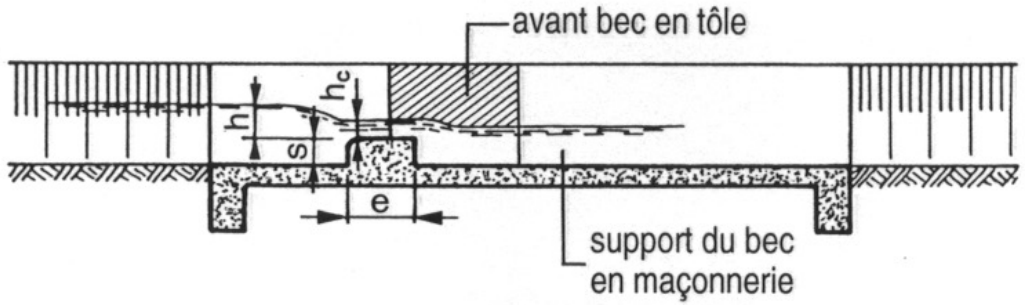


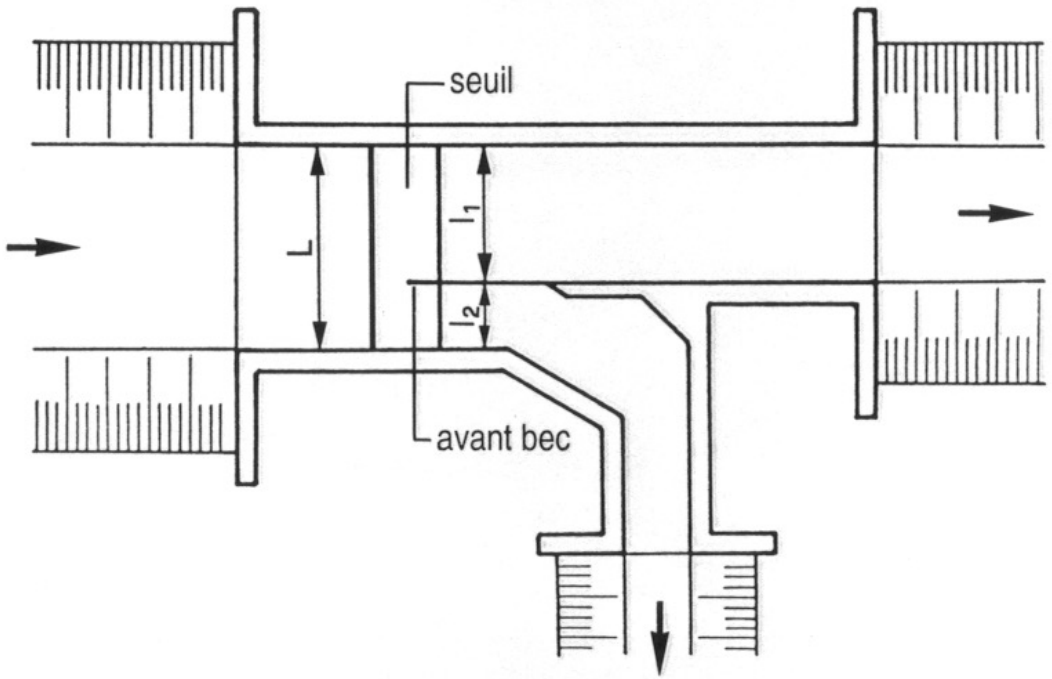
Intake weir



Proportional divider

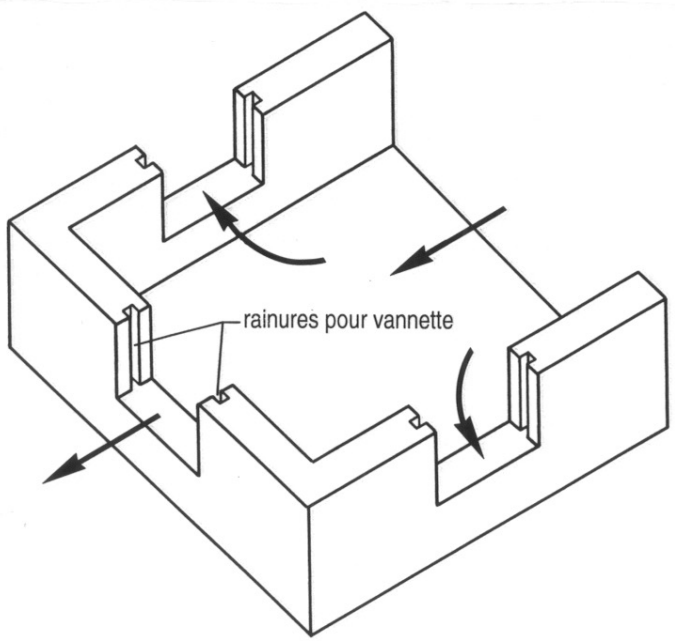


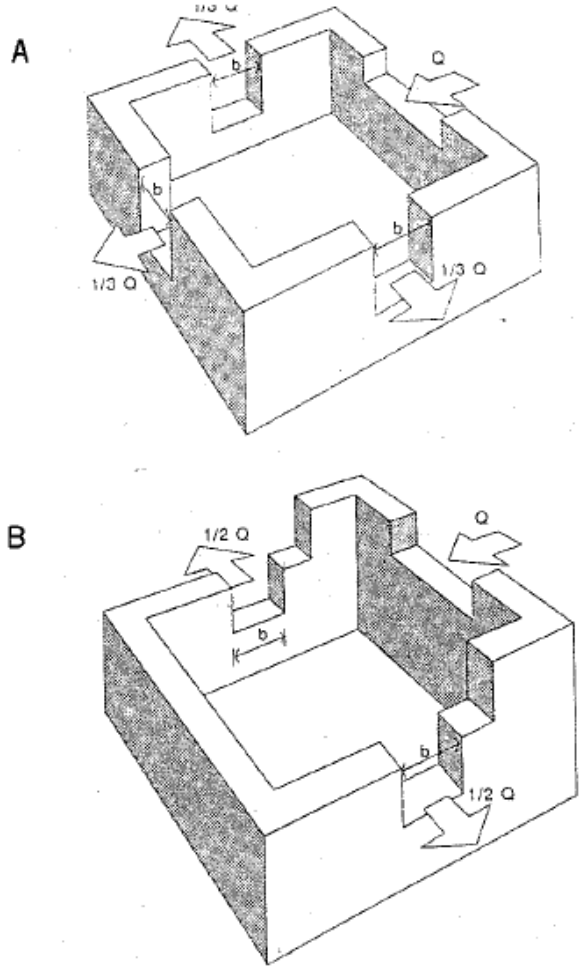


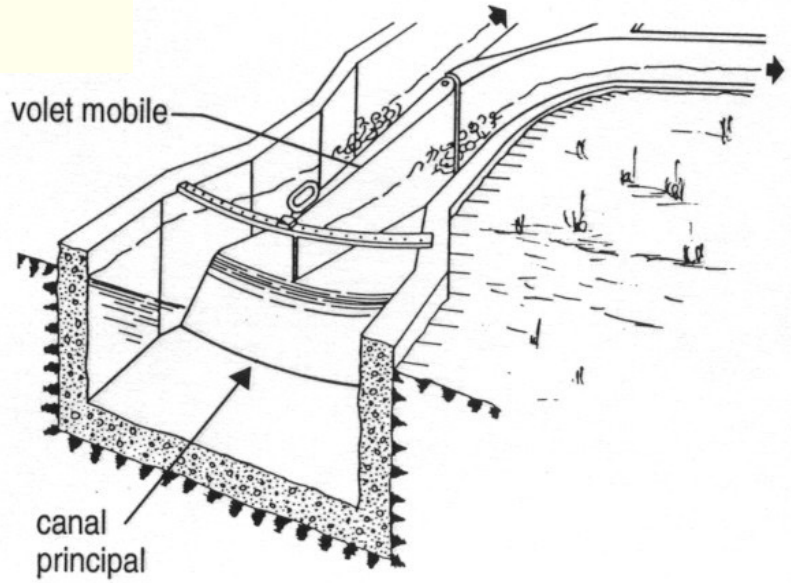


Fixed threshold dividers

Distribution chambers



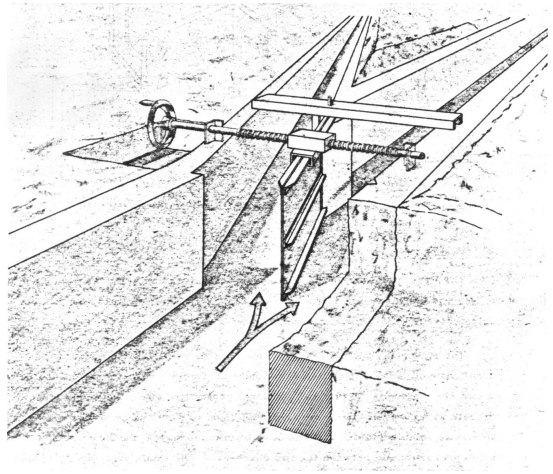


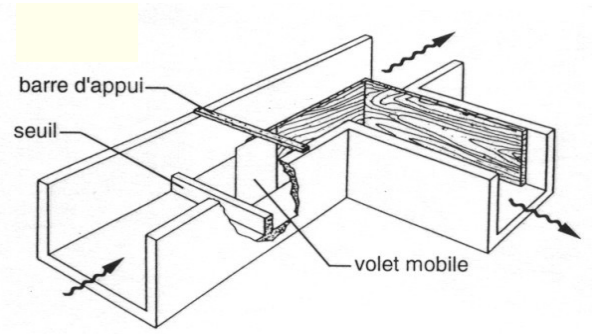


Mobile dividers

Field

Campus

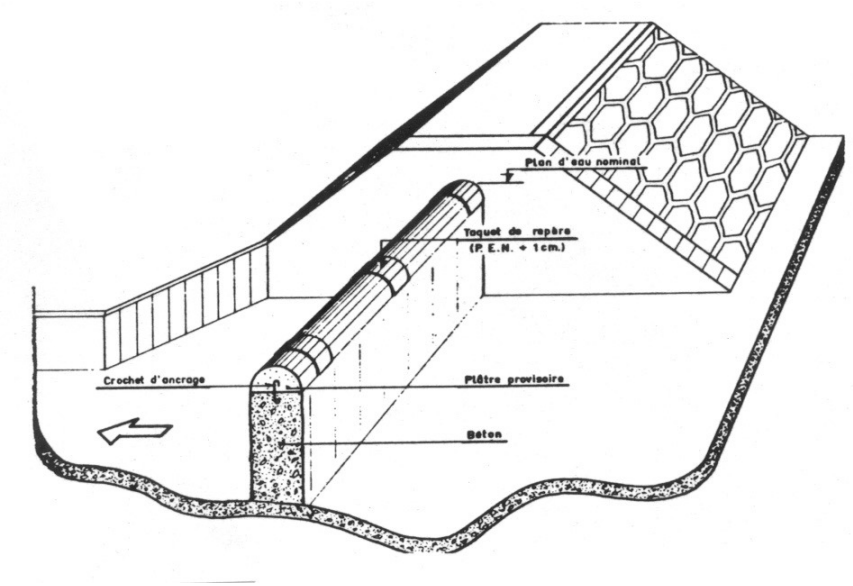


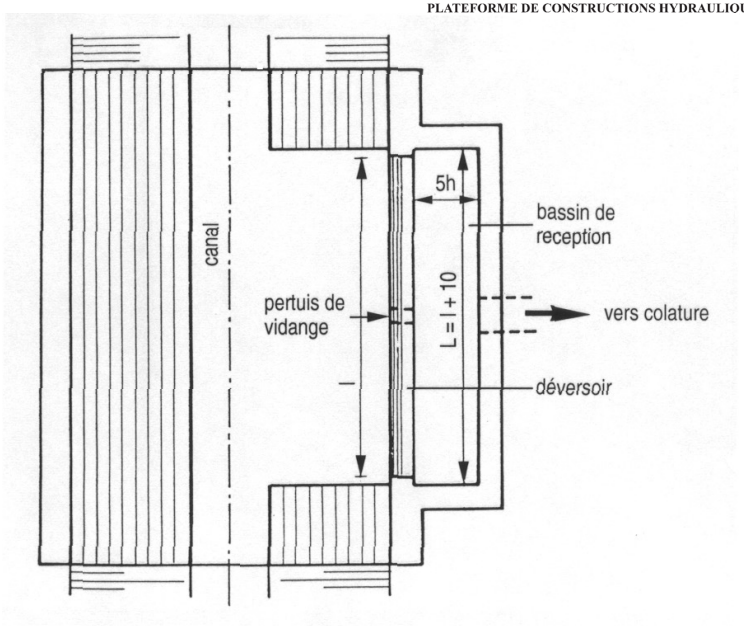


Safety hydraulic structures

Security weirs

- Head of network
- change of section
- before structures likely to be obstructed[1]
- end of channels
- …

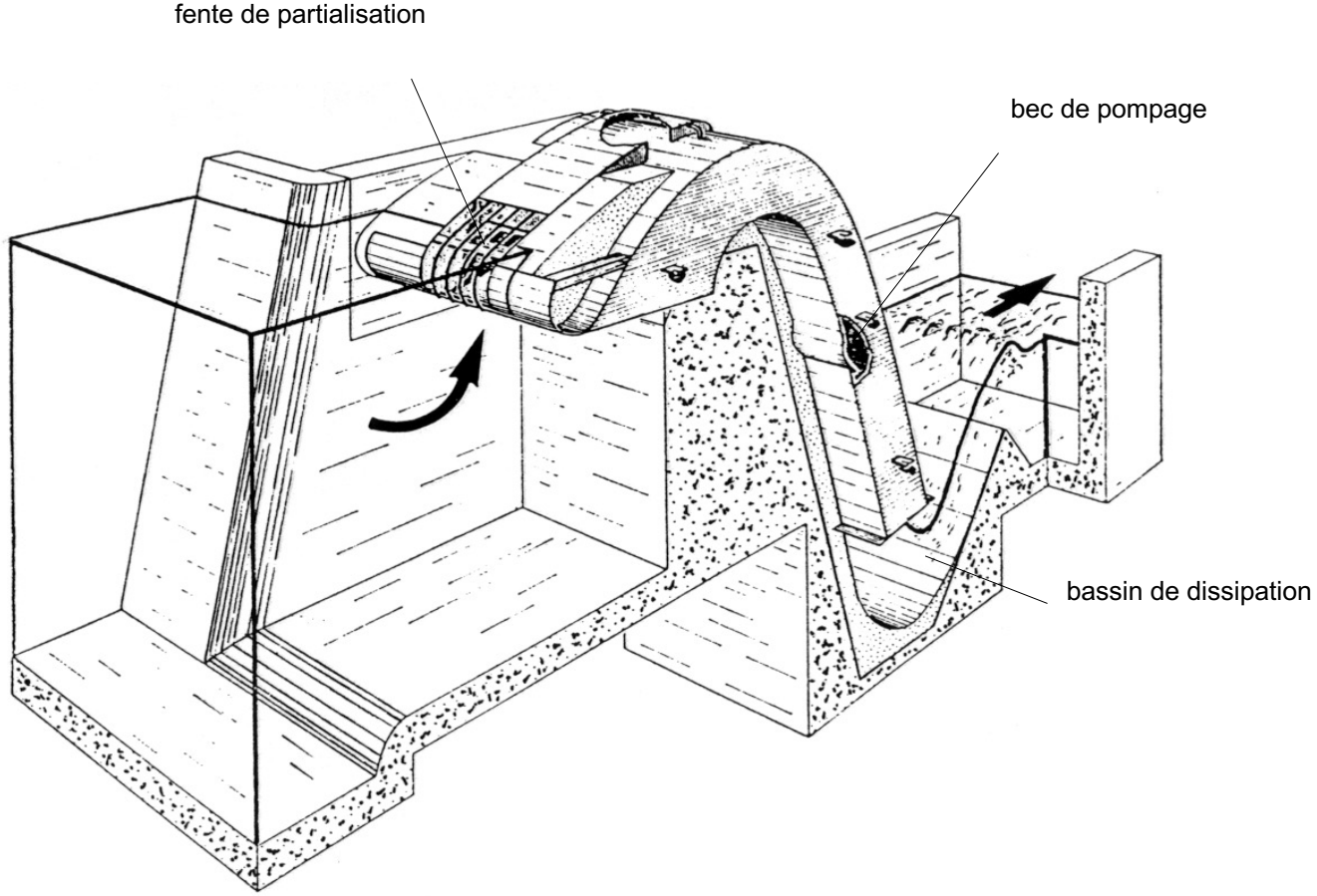




Security weir

[1] Reverse siphons, canal bridges, automatic valves, etc.

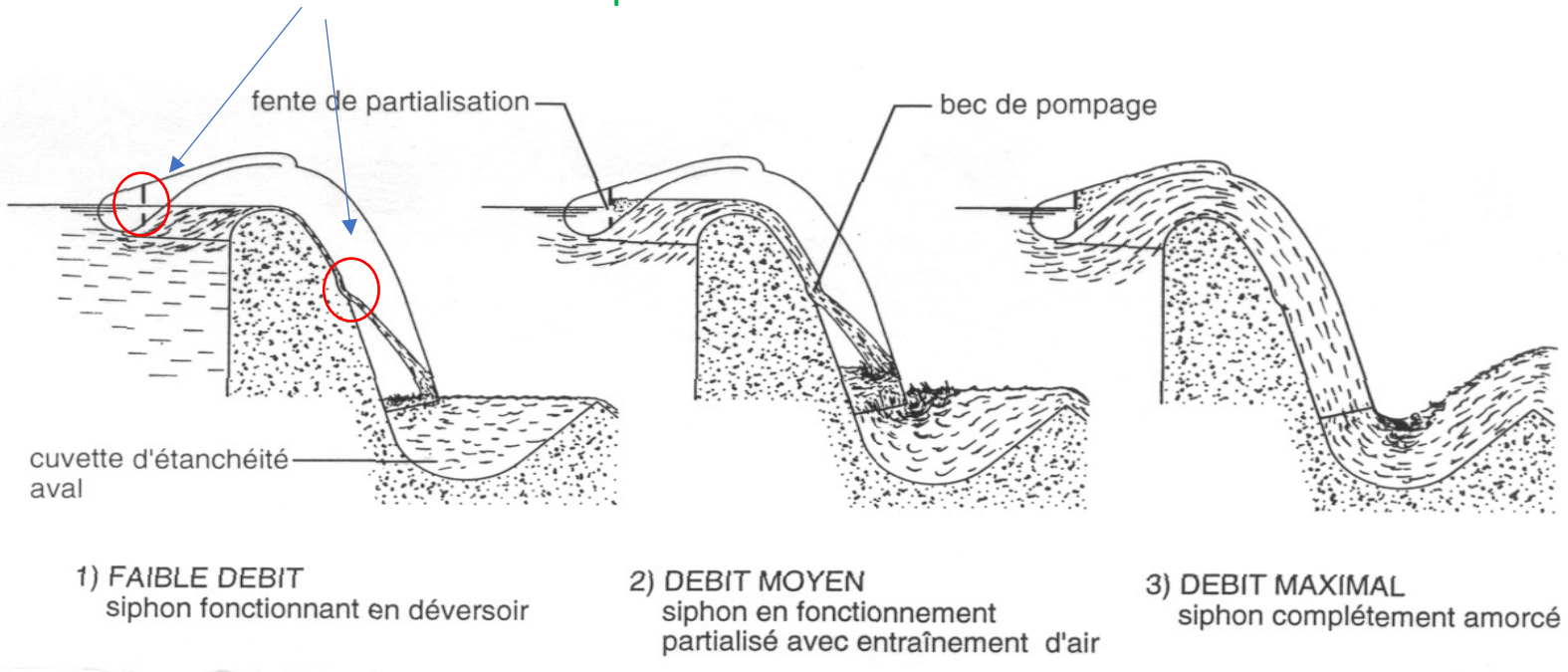
Safety siphon



Campus

Safety siphon in operation

Notice the two important construction details!



The key issue is to design a system that can start without being triggered. The safety siphon has this capability, which makes it very suitable to deplete rising water level and solve emergency situations.