Water Management for Dam Construction

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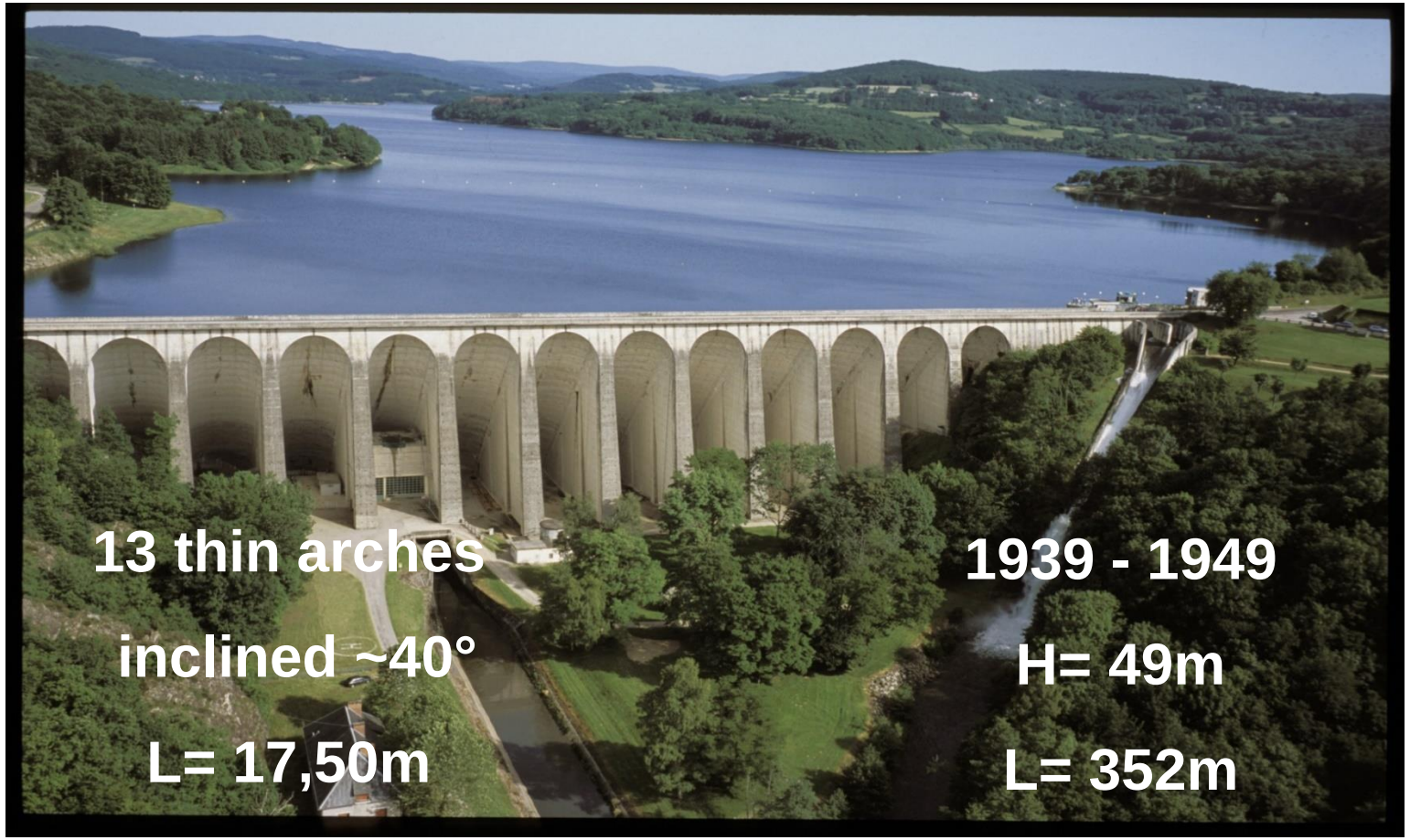
Dam Safety Project – Rehabilitation of the Dam



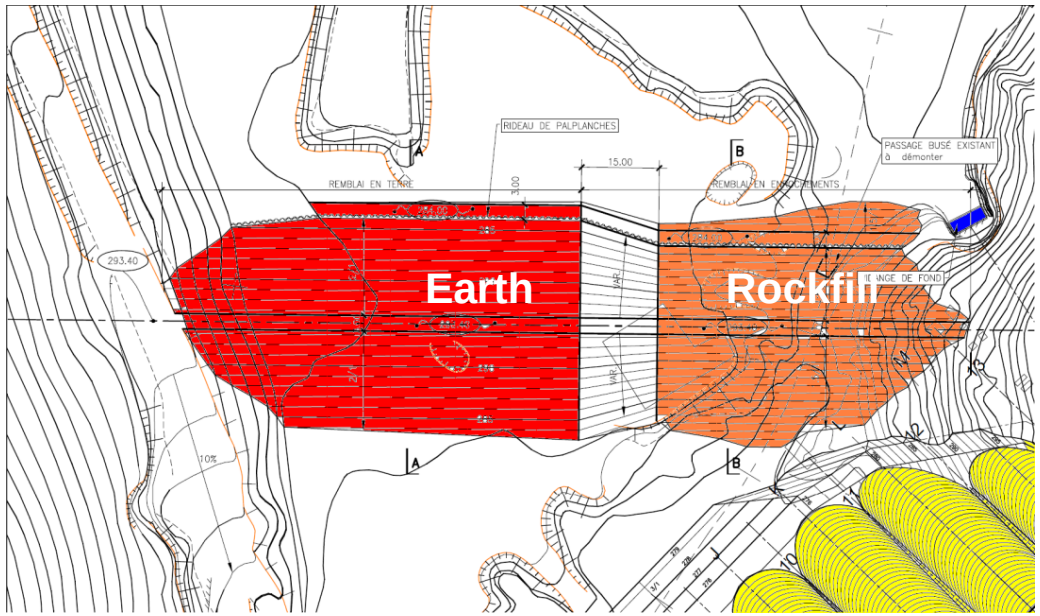
Type	Multiple arch dam
Built	1939-49
Purpose	Multipurpose project: 1. Protection of Paris against Flood 2. Support during low flow season 3. Production of electricity 4. Supply water for navigation canal 5. Supply water for potable water treatment plant 6. Promote touristic activities
Reservoir size	70 Mm^3

Rehabilitation Project of Panneciere Dam

- The dam was the subject of a major reinforcement operation, which included, upstream:
  - Excavation of the foundations down to the rock,
  - Asbestos removal from the upstream face,
  - Partial repair of the sprayed concrete cover,
  - Installation of waterproofing by geomembrane.
- Needed long-term drying (about a year).

Cofferdam Purpose and Initial Design

- Two purposes:
  - Need to provide summer low-flow support (2 Mm3)
  - Need to protect the site from floods and respect maximum flow d/s constraint (stockage= 2,3 Mm3)
  - Total = 4,3 Mm3 of temporary reservoir
- Implantation
  - Height = 17,4m, length 170m
  - Yellow: dam Red: slope 2:1
  - Orange: slope 1.5:1 Blue: bottom outlet



Time Constraints for Building the Cofferdam

- Start of dewatering impossible before November 1st,
- Period at risk of flooding from December 1st to end of March,
- Need to provide low water support from mid-June to October.

- Reconnaissance work and tracks impossible before November,
- 6 months for installation + tracks + construction works) including 4 in wet period,
- Cofferdam to be finished for the beginning of May.

1st hazard : Construction quarry

- Quarry identified very early on (instruction procedure) – Cannot move it
- Expected materials: low arena cover, rock below – but coring revealed rock at very great depth

➢ Use of treatment avoids external supply.

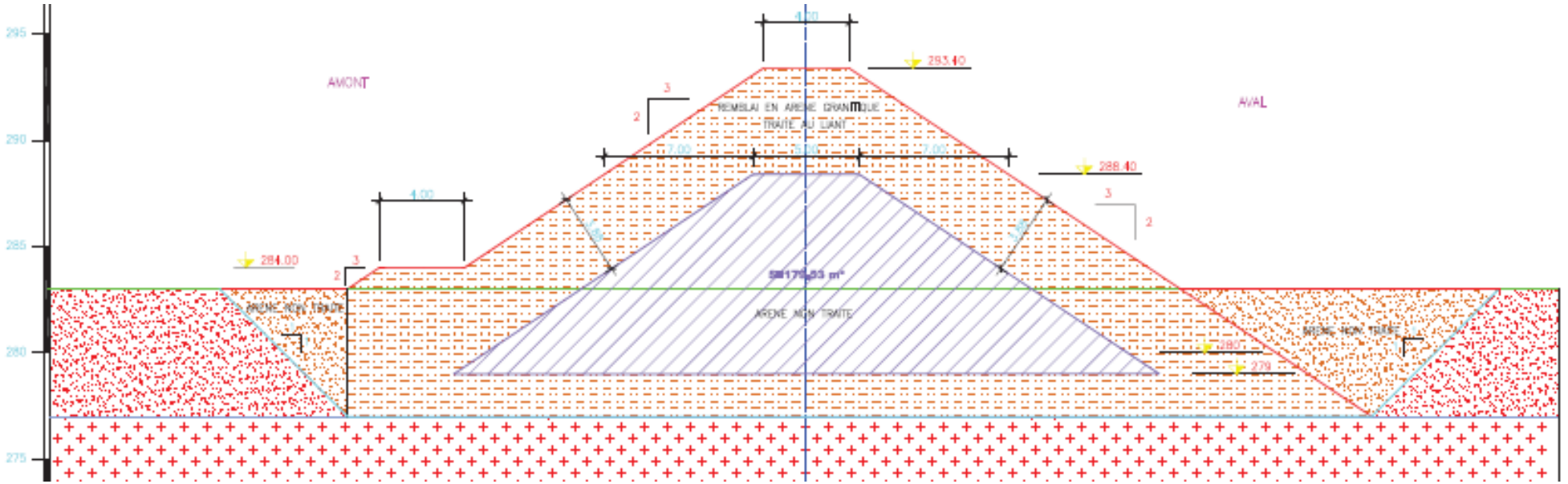
Treatment with Road Binder

- Sand-clay arenas classified B5 (14% passing at 80 μ m)
- Natural water content: 15 to 20% (optimum Proctor w ~ 15%)
- natural material: k = 6.2 x 10-05 m/s
- Dosage of binder retained: 4% LIGEX PR

Dosage en liant	Gonflement volumique après 7 jours	Rtb (MPa) à 7 jours	Module E (MPa)	Perméabilité k (m/s)
5%	1.71%	0.23	3149	7.61×10^{-7}
4%	**1.80%**	**0.19**	**2814**	**1.38×10^{-6}**
3%	1.64%	0.14	2478	5.27×10^{-6}

Final Design

- Instead of a simple stripping, need to disburse 6/7m (5m under water)
- The 2:1 embankment becomes impossible even on RB,
- Final slope beyond 1.5:1 on LB

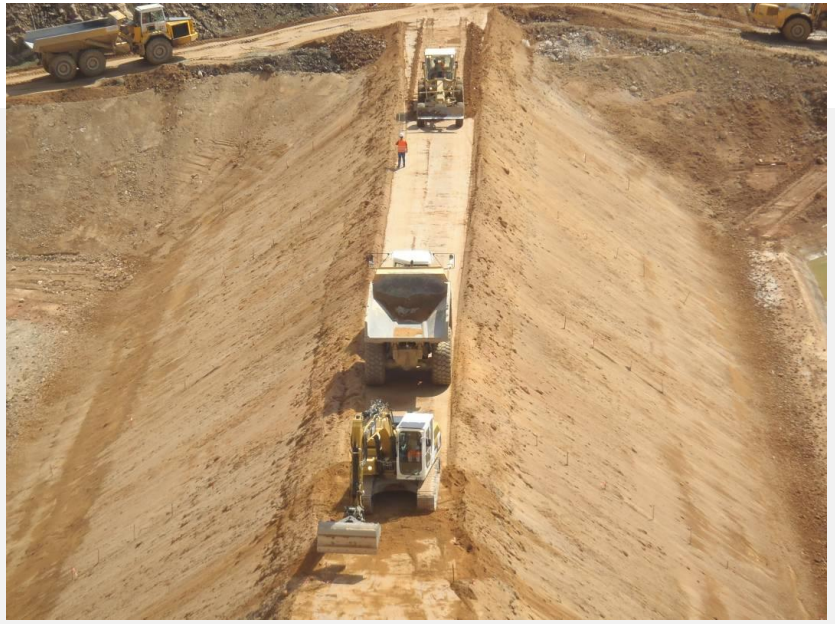


Preparation of the Soil-Cement Material

- Drainage ditches in the quarry
- 2 spreading/mixing passes over a thickness of 50 cm

Earthfill Compaction

- Compaction in 40 cm thick layers
- 3 passes of V5 + 2 passes of VP5
- Use of a "pad foot" for better grip between layers



Feedback

- Upstream : Good behaviour
  - One local instability due to wind waves + local untreated material
  - Superficial layer of uncompacter material (no consequence)
- Downstream
- Good behaviour



Feedback

- Reservoir re-impounding (water speed ~6 m/s during ~10h) : No erosion apart from superficial uncompacted layer (giving the braun color)

Conclusion

- Very good experience
- Cheap compared to BCR
- Construction performed within the time constraints
- To be reused

Questions ?

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Our chief resident
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