



Technical Committee P on CMD  
WORKSHOP

*Cemented Soil Dams  
Soil Preparation Before Treatment*

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## *Soil preparation before treatment*

- Which soils?
  - Soils from deposits or parts of a deposit with different characteristics (soil class, PSD, moisture)
  - Soils with a grading curve to be modified
- Why?
  - To simplify the treatment operations (e.g. application of a single binder dosage)
  - To optimize the composition of the cemented soil for better performance
- When?
  - Before treatment
- How?
  - By homogenization according to a process depending on the morphology of the deposit, the type of heterogeneity (reason and importance) and the use of the cemented soil



## *Processes*

- *Preliminary remark*

*The processes described are taken from actual applications. They are mainly for in-place treatment. Adaptations may be necessary in the case of in-plant treatment.*

1. Direct process at the deposit
2. Intermediate stockpiling
3. Dedicated platform for a standard preparation
4. Dedicated platform for a highly demanding preparation
5. GPS-guided process



## 1. Direct process at the deposit

- Application
  - Homogeneous soil needing moistening
- Pannecièrre (France): cofferdam
  - Granite arena:
    - PSD: 0/5 mm
    - Fines content: 14%
  - Moistening by water injection
  - Treatment (4% hydraulic binder)\*
  - Loading, hauling and placement
  - Remark:
    - Successfully submitted to a voluntary overspilling (8h)
  - *See CSD Bulletin Data Sheet*

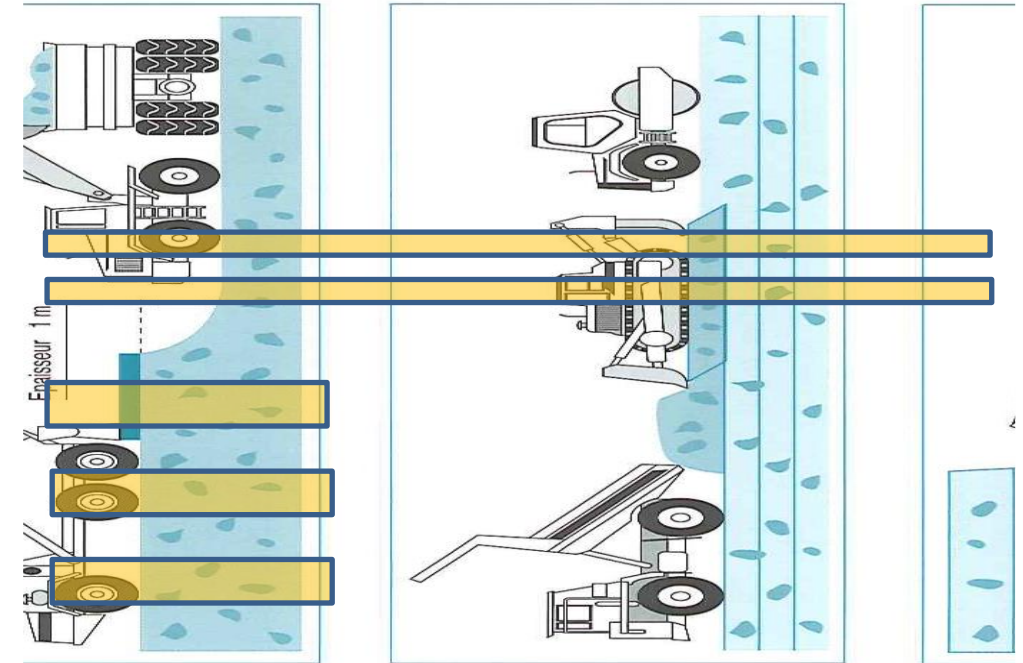


\* by dry weight of the soil



## 2. Intermediate stockpiling

- Application
  - Suitable for projects with important volumes
  - Need for enough space for stockpiling
- Common practice in road earthworks
  - Stockpiling in horizontal layers
  - Vertical extraction
  - Water adjustment and treatment necessarily on a dedicated platform or at the placement area
  - Suitable for in-plant treatment
  - *Cf. French Guide for Soil Treatment – LCPC/SETRA (2000)*



## 3. *Dedicated platform for a standard preparation*

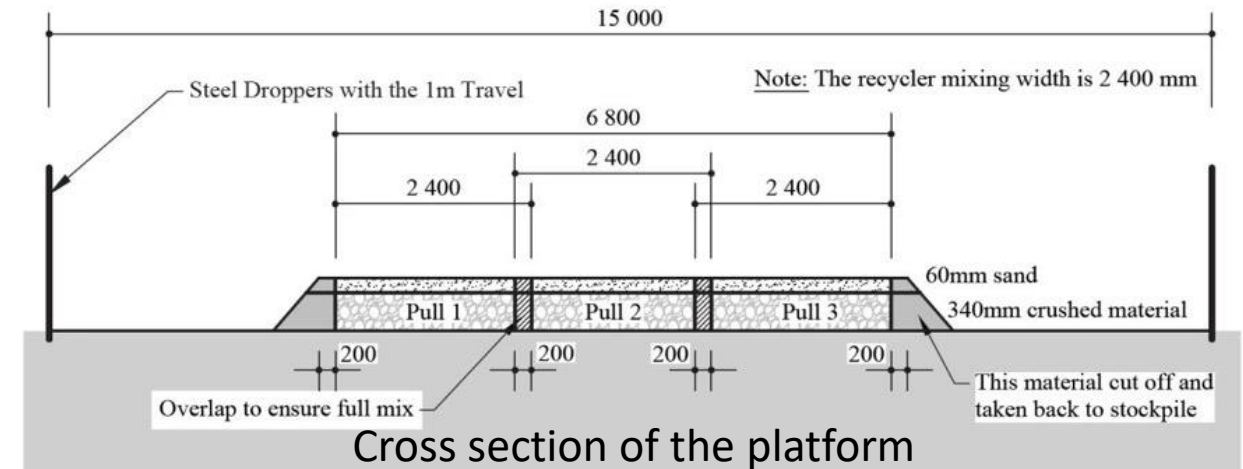
- Application
  - Projects with small to medium volumes
- Vlassenbroek (Belgium):  
Levee protection carapace
  - Low plasticity silt: PI = 11
  - Placement of the soil on the platform
  - Grading by a GPS-assisted bulldozer
  - Moistening (surface spreading) and mixing
  - Treatment (quicklime: 2%)\*
  - Loading, hauling and placement
  - *See CSD Bulletin Data Sheet*

\* by dry weight of the soil



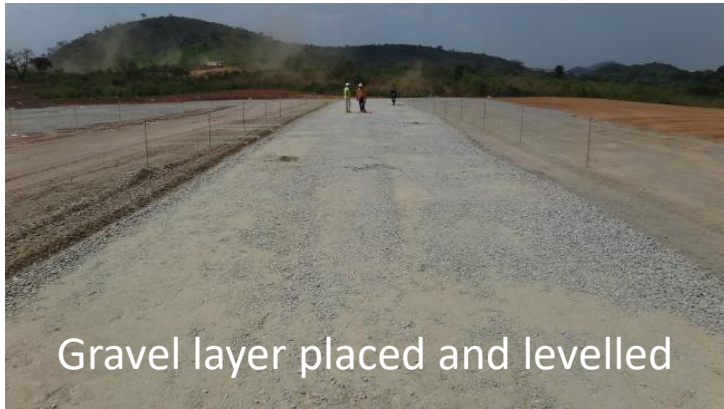
## 4. Dedicated platform for a highly demanding preparation

- Application
  - Projects with small to medium volumes
- Ambarau (DR of the Congo): Hardfill dam
  - Dedicated stabilized platform: 90m x 120m
  - Mixing of 2 materials:
    - 85% of crushed aggregates: PSD 0/40 mm
    - 15% of river sand
  - Moistening (surface spreading) and mixing
  - Treatment (cement: 100 kg/m<sup>3</sup>)
  - Loading, hauling and placement
  - Remarks:
    - Final hardfill volume: 30,000 m<sup>3</sup>
    - Placement peak: 800 m<sup>3</sup>/day
  - *See Icold Committee P workshop (Prague 2017)*



## 4. *Dedicated platform for a highly demanding preparation (cont.)*

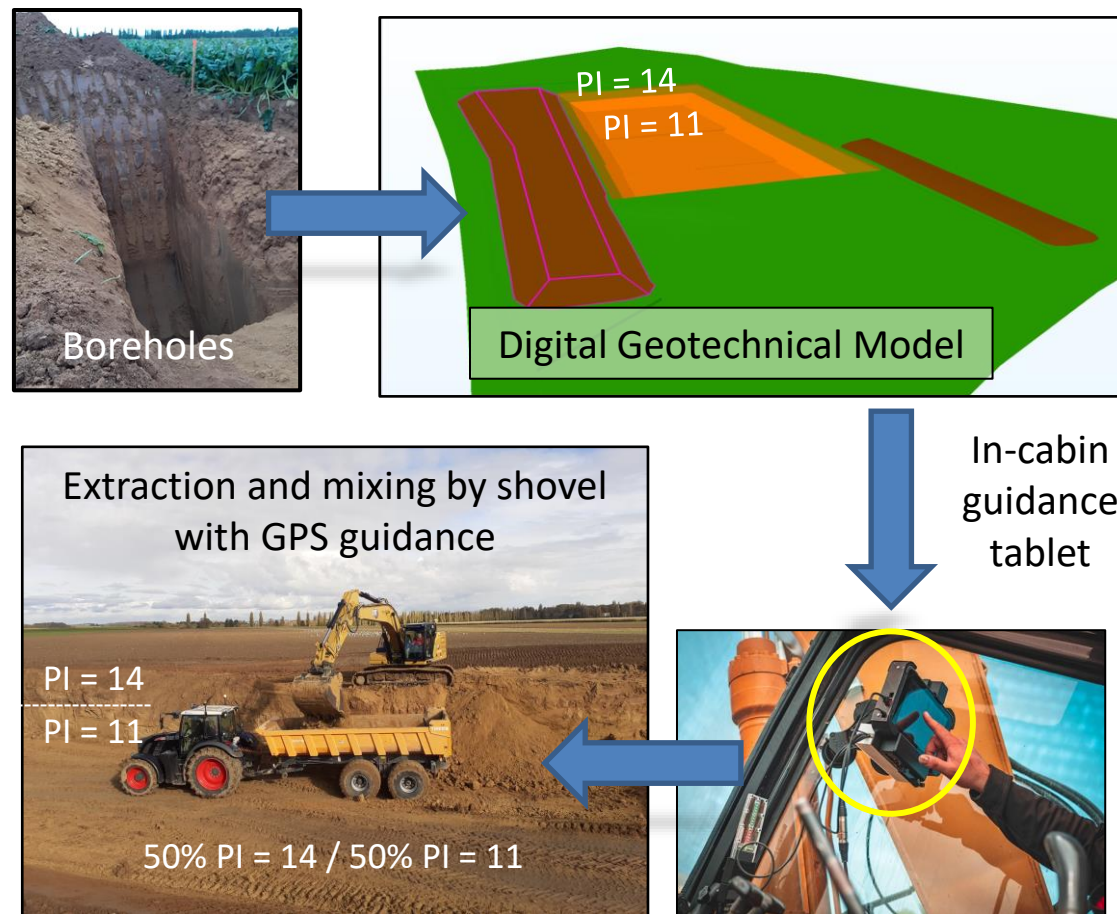
- Ambarau (DR of the Congo): Preparation and treatment of the hardfill mix





## 5. GPS-guided process

- Application
  - Sub-horizontal layers deposit
- Seine North Europe Canal project (France):  
Cemented soil demonstrator
  - Mixing of 2 materials:
    - 50% medium plastic silt: PI = 14
    - 50% low plastic silt: PI = 11
  - Digital geotechnical model of the deposit
  - Data transfer to an in-cabin assistance tablet
  - GPS-guided extraction to the right depth
  - Respect of the 50/50 ratio
  - Mixing by shovel and loading
  - *See 5<sup>th</sup> International Seminar on Earthworks in Europe (Prague 2022)*



## *Acknowledgements*

1. Direct process at the deposit: Vincent MOUY (*Tractebel - France*)
2. Intermediate stockpiling: LCPC (*France*)
3. Dedicated platform for a standard preparation: Patrick PEETERS (*Flanders Hydraulics Research - Belgium*)
4. Dedicated platform for a highly demanding preparation: David CAMERON-ELLIS (*ARQ Consulting Engineers - South Africa*)
5. GPS-guided process: Maurice BUFALO (*Valerian Company - France*)

