

**GЕOPOLYMER CAMP 2022.**

**POSSIBLE USE OF GEOPOLYMER TECHNIQUES  
FOR PUBLIC WORKS ?**

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## WHO IS Jean-Claude GRESS ?

- 1971 : Graduated from Ecole Nationale Ponts et Chaussées.
- 1971-1983 : Geotechnical Engineer in FONDASOL : more than thousand buildings and bridges foundations studies.
- 1983-2012 : I developed HYDROGEOTECHNIQUE ; today 68 engineers working still on buildings and bridges foundations studies but also on highways, motorways , railways, canals, dams, dykes, etc ;
- 1983-2012 : Professor Ecole Nationale Travaux Publics de l'Etat, Soil and Rock Stabilisation and Treatment Techniques.
- 2012-2021 : Geotechnical Expert.
- 2012-2020 : Mayor of FONTAINES small city.

Discover Geopolymer Techniques through J. DAVIDOVITS videos. Wonder if it could be interesting for public works ?

- FIRST TOPIC. Hardening of road courses. Base, subbase and load bearing soil are nowadays hardened with lime and cement or hydraulic binders. Why not geopolymer techniques ?

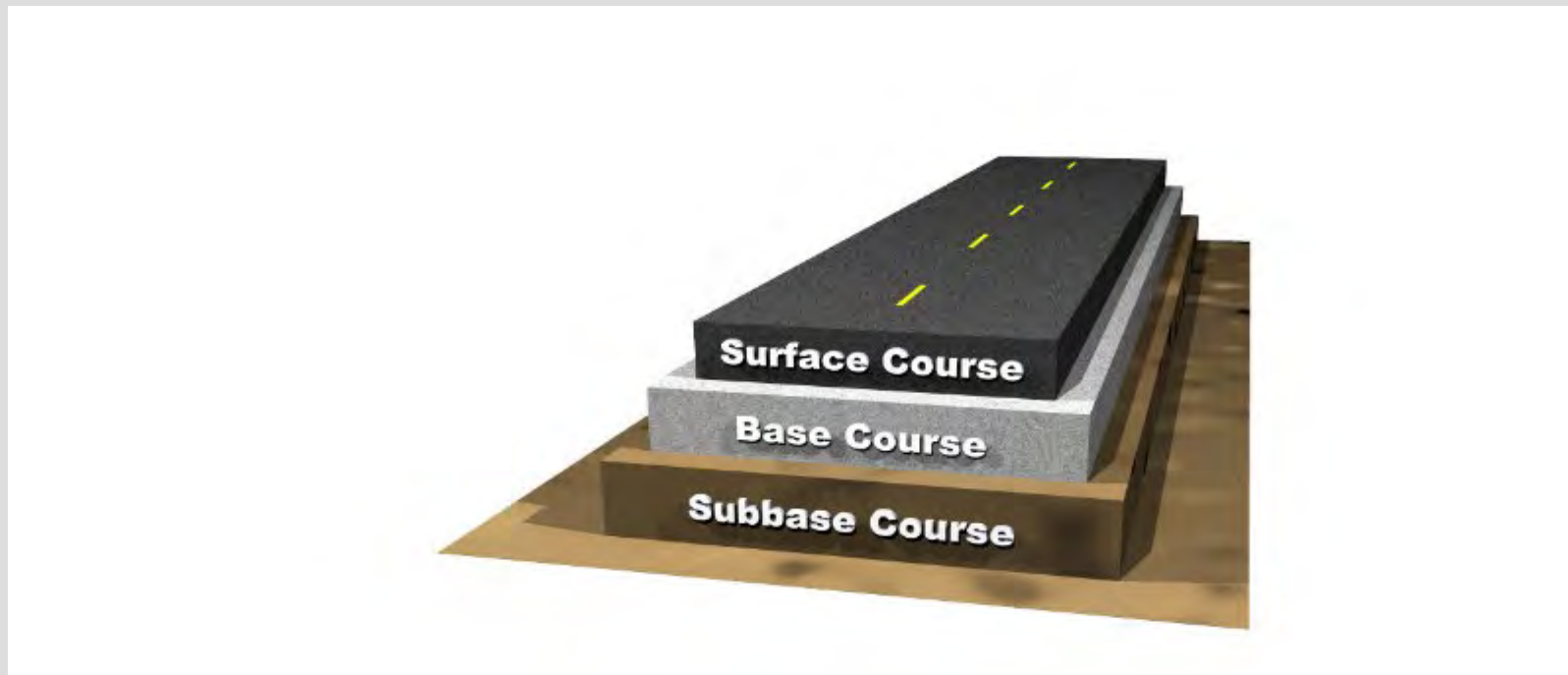


Figure 1 : Basic Flexible Pavement Structure

## GEOPOLYMERS FOR GRAVEL ROADS ?

- SECOND ONE. Mayor of FONTAINES. 2000 inhabitants.  
30 km of gravel field paths. Thousand of potholes. Possible to avoid with geopolymers ?



Figure 2

## GEOPOLYMERS FOR PUBLIC WORKS ?

- THIRD ONE. Natural cavities or underground quarries. Possible to fill it with a geopolymer foam : soil of low plasticity, foaming agent, geopolymer technique ?



Figure 3

## GEOPOLYMERS FOR PUBLIC WORKS ?

- FOURTH ONE. Precast blocks for retaining walls.



Figure 4



## GEOPOLYMERS FOR PUBLIC WORKS ?

- SIXTH ONE. Noise barrier. Soil hardened through geopolymer technique.



Figure 5

## GEOPOLYMERS FOR PUBLIC WORKS ?

- SEVENTH ONE. Soil reinforcement through soil treated columns.



Figure 6



# GEOPOLYMERS FOR PUBLIC WORKS ?

- Impervious cut off wall, use of a **long reach backhoe**.

## 19. Barrage à l'eau

Figure 4  
Principe  
de réalisation  
de la paroi  
Sketch  
of cut off wall  
execution

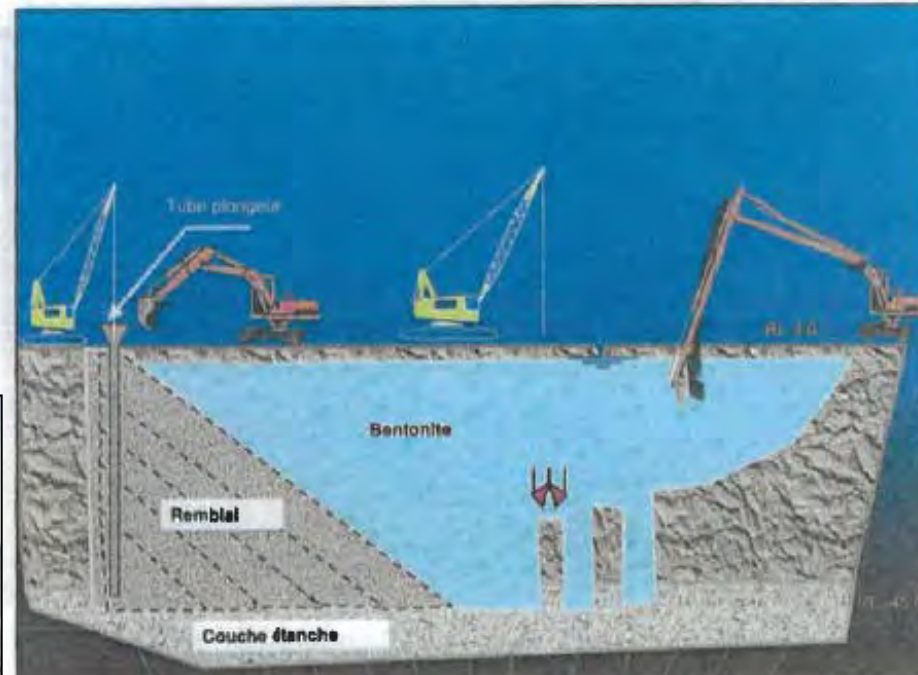


Photo 3

La pelle rétro  
à bras long  
Long reach  
backhoe



# GEOPOLYMERS FOR PUBLIC WORKS ?

- Use of **buckets** to execute the trench stabilized with **bentonite**.

## EQUIPMENTS



HYDRAULIC KELLY BUCKET GRAB



HYDRAULIC CABLE BUCKET GRAB



MECHANICAL CABLE BUCKET GRAB

Figure 8



## GEOPOLYMERS FOR PUBLIC WORKS ?

- Mixing in place soils and geopolymer components with an **hydrofraise**.



Figure 9

HYDROFRAISE

# GEOPOLYMERS FOR PUBLIC WORKS ?

- Use of Trenchmix machine to execute an impervious barrier.

## Trenchmix

Utilisation du procédé Trenchmix® pour la réalisation d'écrans étanches.

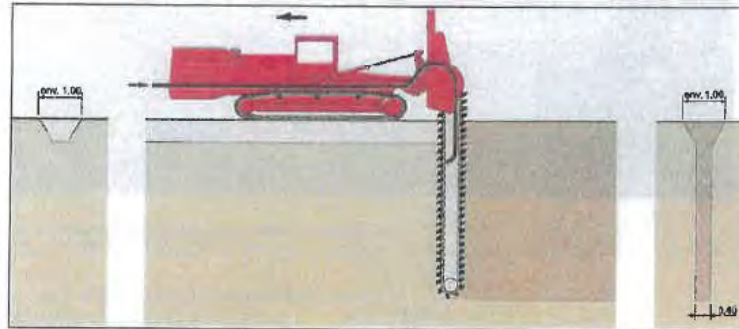


Figure 1  
Principe du Trenchmix®  
Trenchmix® schematic

Photo 7

Hauconcourt, écran étanche sous la digue : épandage du liant dans la prétranchée

*Hauconcourt, watertight barrier under the dyke : spreading binder in the preliminary trench*



Photo 8

Hauconcourt, écran étanche sous la digue : exécution de la coupure étanche à 6 m de profondeur



Figures 10

# GEOPOLYMERS FOR PUBLIC WORKS ?

## ➤ Compaction grouting

- injection pipe inner to the drilling rods,
- low slump mortar grout injected at the bottom of the pipe, removed slowly in lifts,
- creating a column of overlapping grout bulbs increasing soil density friction angle of surrounding soils.

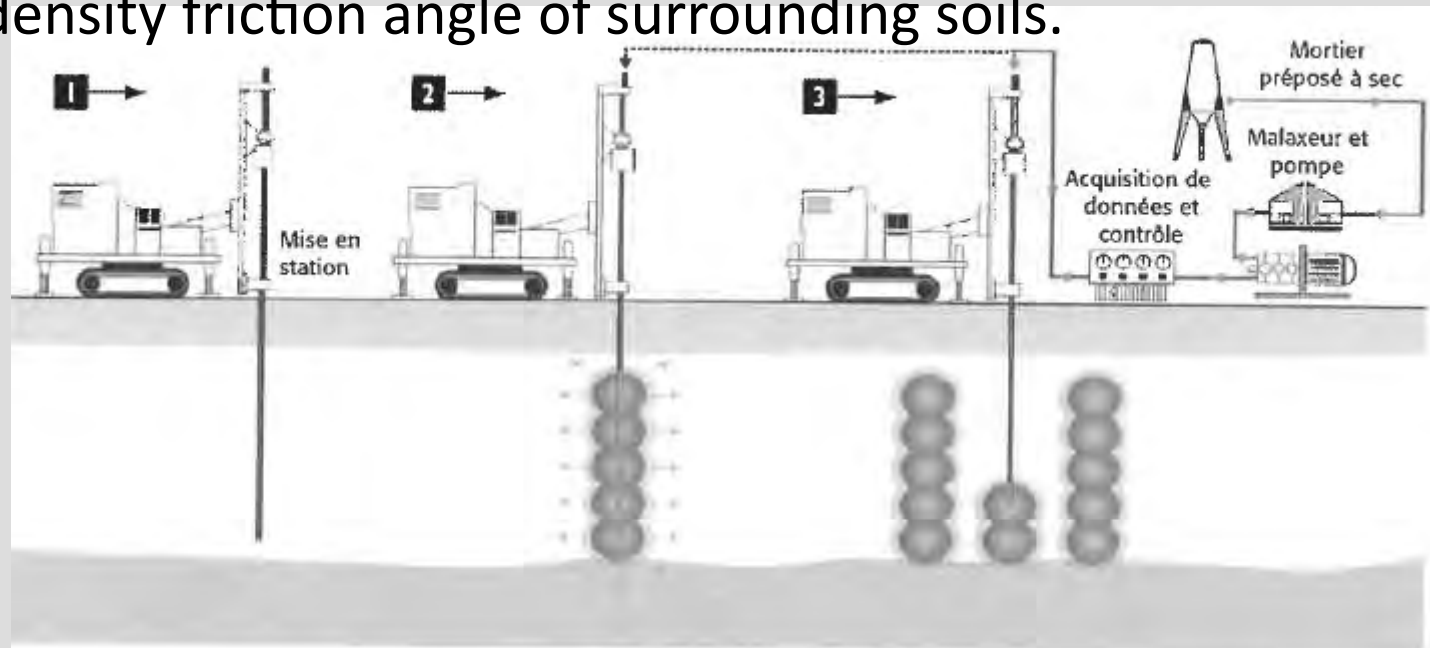


Figure 11

Procédure d'exécution de l'injection solide (Compactage Statique Horizontal, CHS®) (source : Keller)

## GEOPOLYMERS FOR PUBLIC WORKS ?

*Thank you for your attention.*