

PhD thesis:

## Filter criteria for granular soils

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**Location :** LTDS, Ecole Centrale de Lyon + University of Queensland

### Context:

Recent researchs showed that the distribution of throats (Constriction Size Distribution or CSD) between pores play a key role to understand the filtration properties of a granular soil. Some analytical models to reach in quick way the CSD exist in the literature. They take into account the particle size distribution (PSD) and the density of the material but are derived from geometrical analyses considering the grains as spheres. It may hold true for some sands but this hypothesis is no longer adapted for fluvial gravels. Moreover, these models were only validated for materials having continuous gradings, which is not always the case on site.

The aim of this PhD thesis is to built new analytical models for the CSD considering the grading, the density but also the shape of the particles and to derive a filter criterion adapted for different kinds of granular soils.

### Work:

- Numerical modeling : creation of samples made of polyhedral particles for different kinds of grading and particle shape (Discrete Element Method, DEM)
- Derivation of the CSD considering the PSD, the density and the shape of particles
- Construction of a new analytical model for the CSD
- DEM filtration analyses of the numerical samples
- Design of adapted filter criteria
- Experiments : validation of filter criteria for actual fluvial gravelly soils

**Application:** the process is closed as soon as the adequate applicant has been found

**Collaboration:** LTDS-Ecole centrale de Lyon (France), TU Weimar (Germany), University of Queensland (Australia), Compagnie Nationale du Rhône (France)

**Skills:** C++ programming, UNIX, Matlab, porous materials

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