Internal stability of granular materials in triaxial tests

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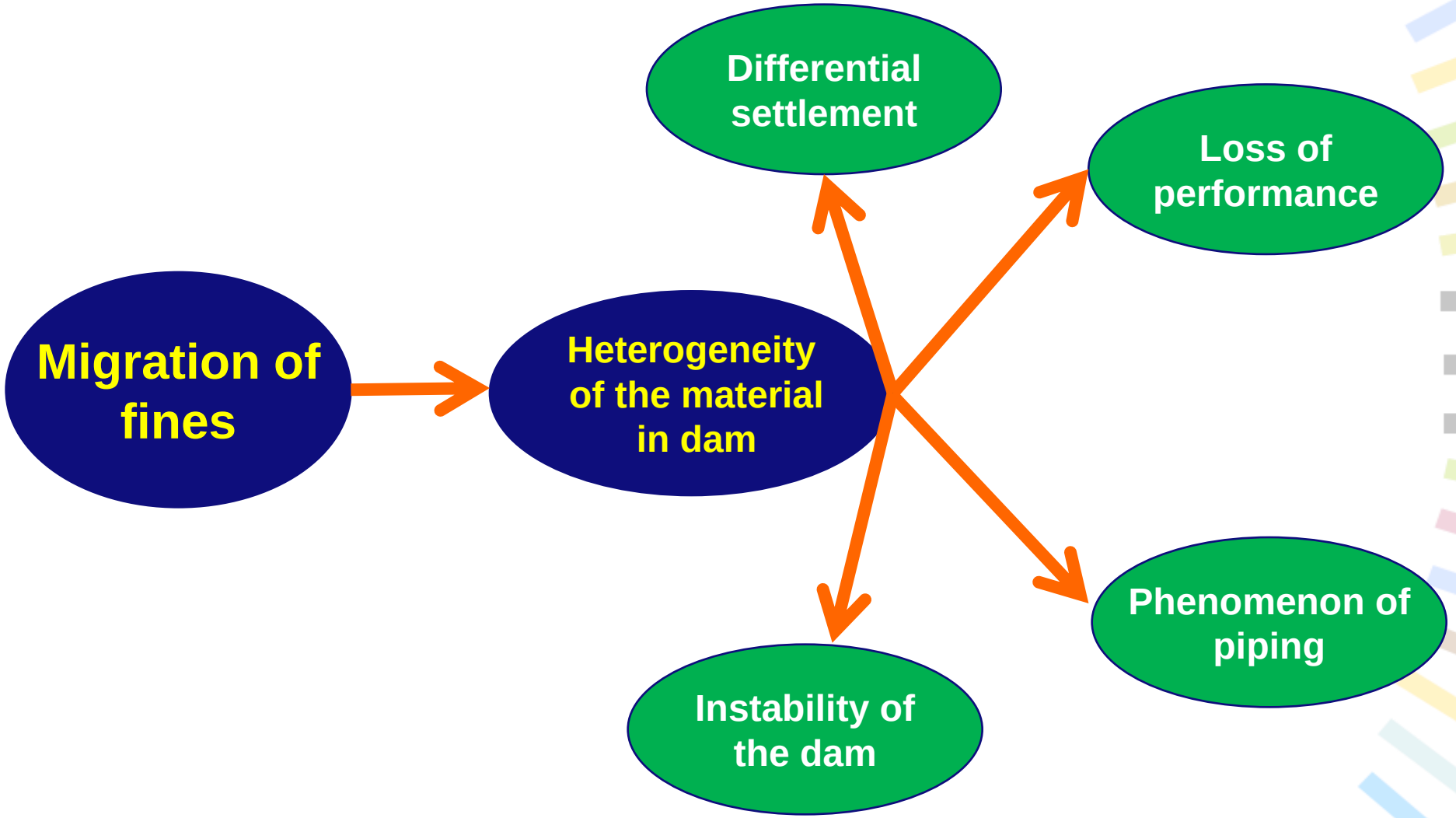
I. INTRODUCTION

OVERVIEW OF THE MIGRATION OF FINES:



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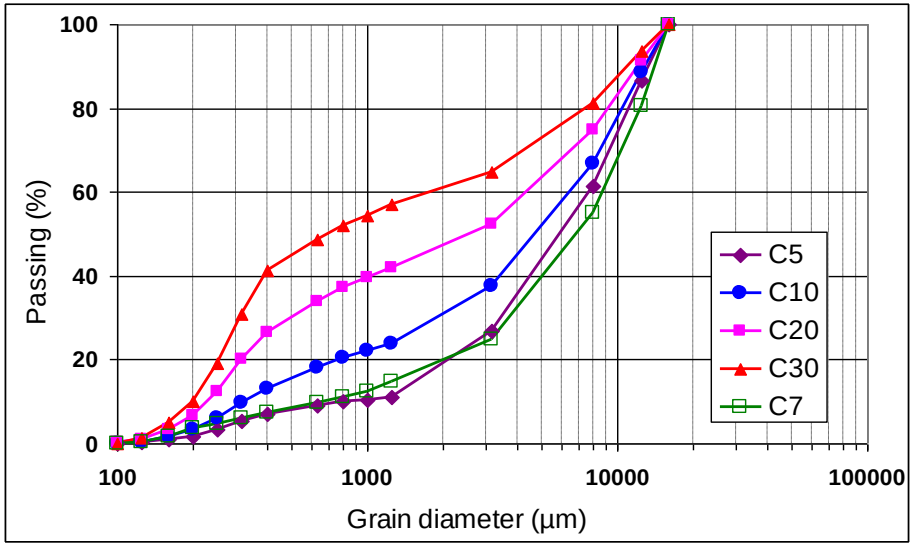
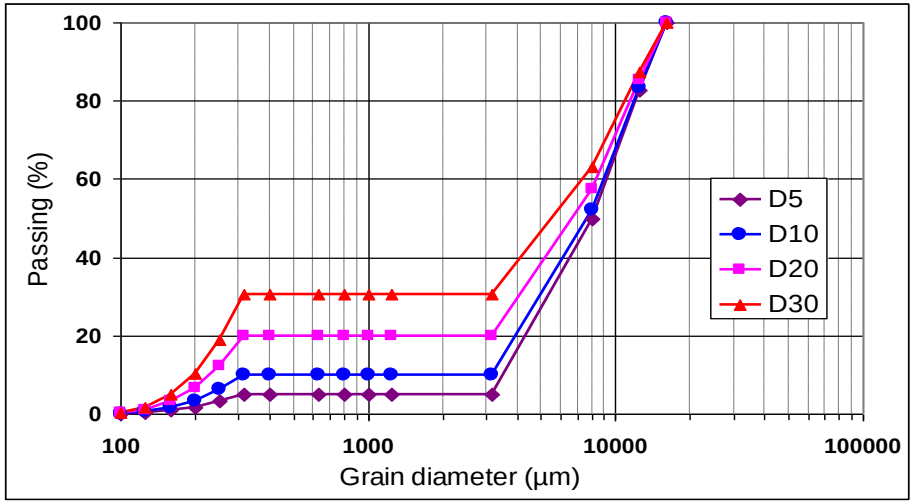
II. PRESENTATION OF THE MATERIALS



Continuous grain size distribution



Discontinuous grain size distribution

Name		< 0.315 [mm]	C_U
C5	continuous	5	13,7
C7		7	9,4
C10		10	20,7
C20		20	19,1
C30		30	8,5
D5	discontinuous	5	2,6
D10		10	2,9 - 29
D20		20	35,7
D30		30	35,5

Fine = Φ < 0.315 mm

Cx or Dx = material having respectively continuous or discontinuous grain size distribution, containing x% of fines

All materials have Cu =d60/d10>2, then : *widely graded*

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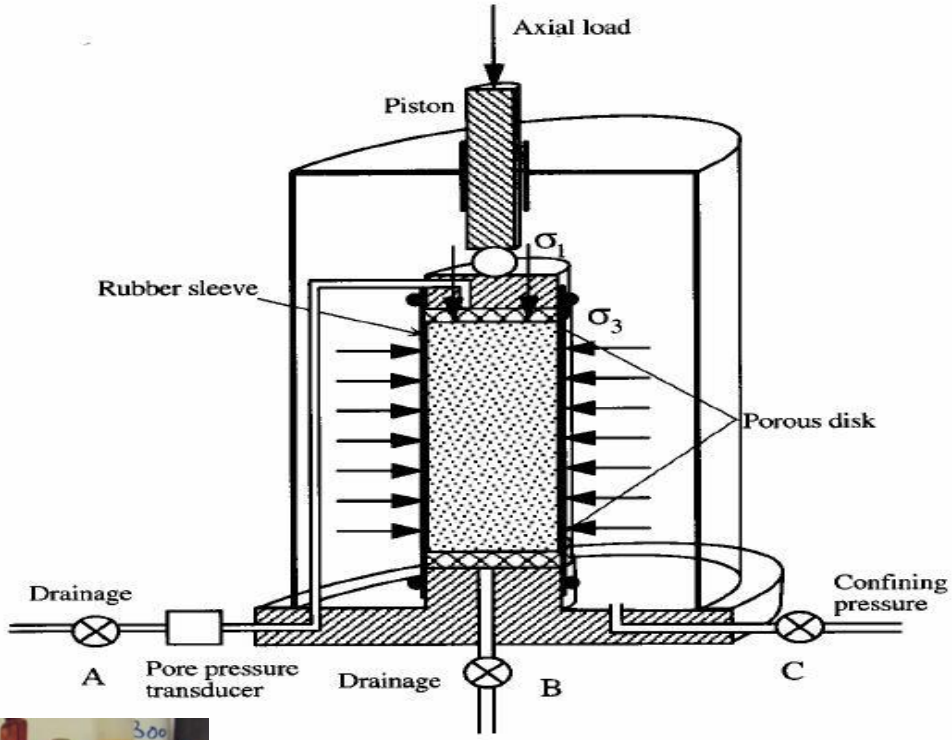
III. EXPERIMENTAL PROCEDURE OF THE TESTS

Equipment:

✓Triaxial cell;
✓the loading frame

Pressure controller



The triaxial test is consists in:

- Saturating;
- B check = Δu/Δσ3;
- Consolidating;
- Shearing.

- 2 Relative densities:Dr = 50, 90%;
- 3 effective confining stresses:
  σ'3 = 50, 100, 200kPa;
- Initial water content: 0 to 4 %.

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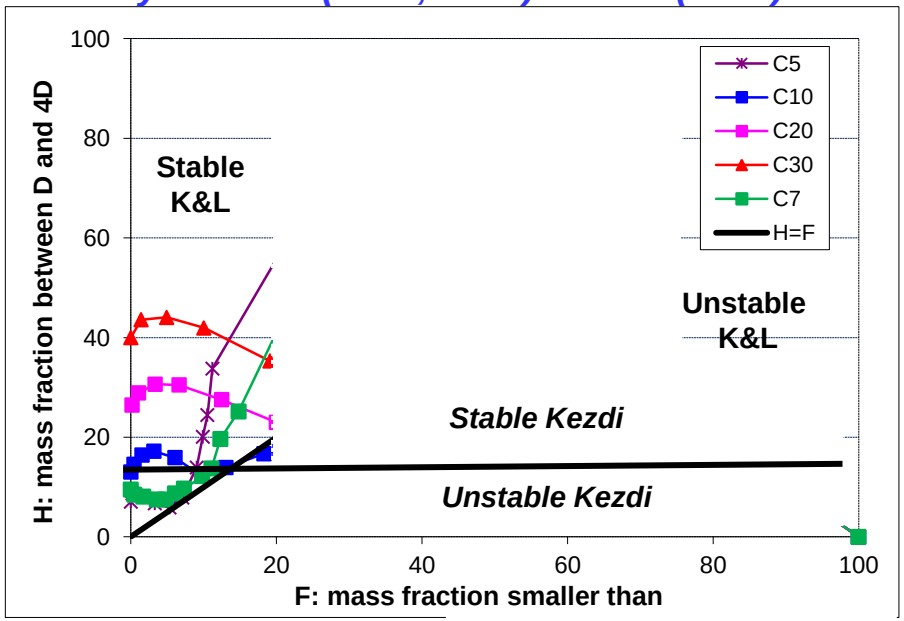
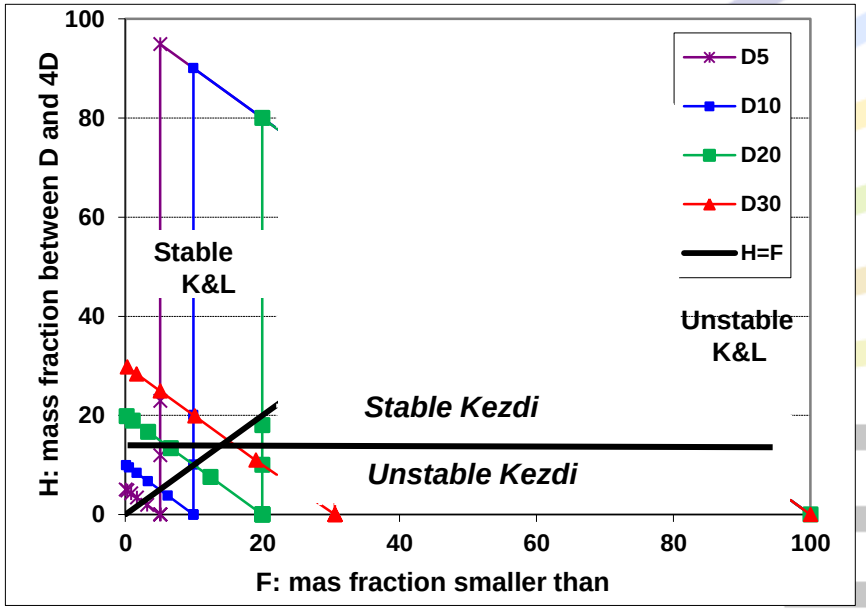
CRITERIA TO EVALUATE INTERNAL STABILITY

1) Terzaghi (1953);
2) Kezdi (1979);
3) Kenney and Lau (1985; 1986);
4) Burenkova (1993).

IV. INTERNAL STABILITY OF THE MATERIAL

Kenney and Lau (1985; 1986)+ Kezdi (1979):





Widely Graded **Widely Graded**

Continuous grain size distribution **Discontinuous grain size distribution**

	C5	C7	C10	C20	C30	D5	D10	D20	D30
Kenney & Lau (1985, 1986)	S	S	S	S	S	U	U	U	U
Kenney & Lau (1985,1986) + Kezdi (1979)	U	U	U	S	S	U	U	U	U

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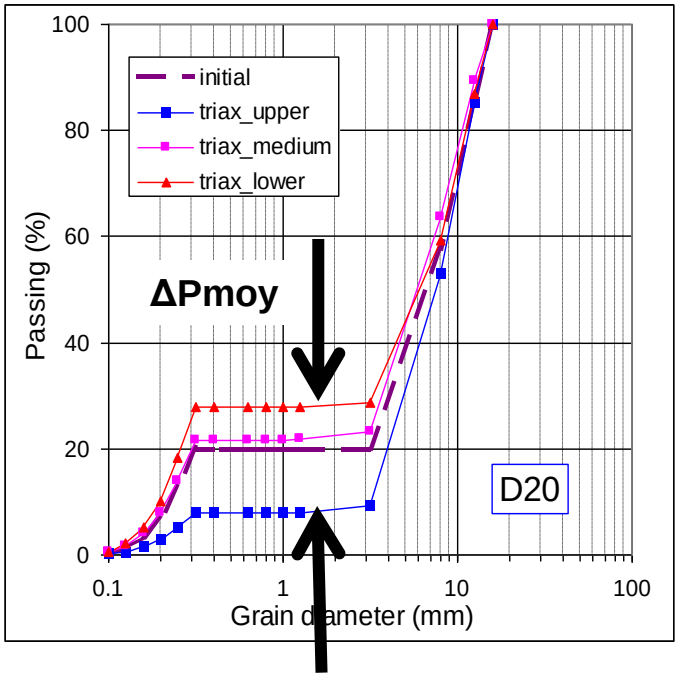
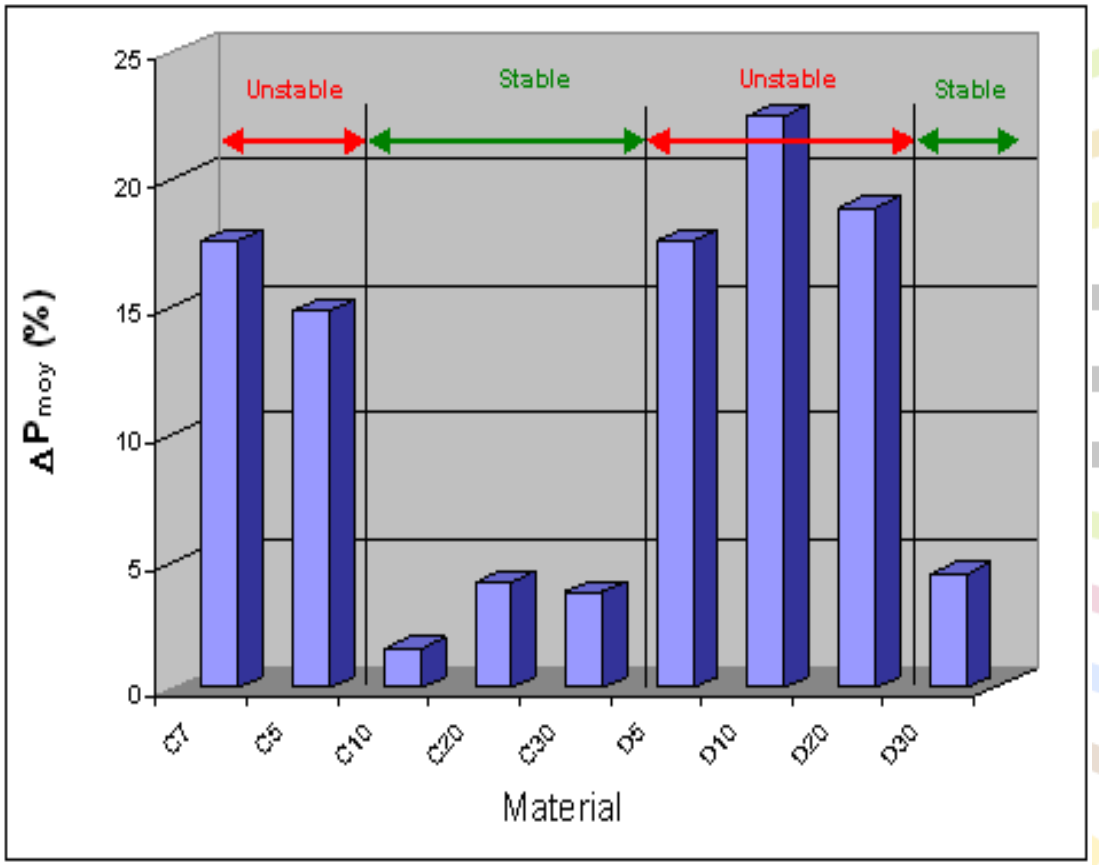
V. RESULTS

DIRECT MEASUREMENT OF THE STABILITY OF THE STUDIED SOILS AFTER TRIAXIAL TESTS



Size analysis tests

- **ΔP≤10%: Stable;**
- **ΔP>10%: Unstable.**



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VI. CONCLUSION

Summary table

	C5	C7	C10	C20	C30	D5	D10	D20	D30
Direct measurement	U	U	S	S	S	U	U	U	S
Kenney & Lau (1985, 1986)	S	S	S	S	S	U	U	U	U
Kenney & Lau (1985,1986) + Kezdi (1979)	U	U	U	S	S	U	U	U	U
Terzaghi, USACE (1953)	S	LS*	S	S	S	U	U	U	U
Burenkova (1993)	LS*	U	LS*	S	U	LS*	LS*	U	U

* *Limite Stable*

- None of the criteria gives a correct answer for all the soils (this can be caused by differences in test conditions);
- In the present test, the combination of Kenney & Lau (1985, 1986) and Kezdi (1979) gives the best assessment of the internal stability of soils;
- analysis of internal stability of soils must take into account several parameters.

Thank you for your attention!