

3. In-Situ Testing

3.1 Introduction

- Aims
 - To classify the soil into group of materials which will exhibit broadly similar engineering behavior
 - To determine parameters which are required for engineering design calculations
(strength, deformation and groundwater flow)

- Advantages and Disadvantages (over laboratory tests)
 - Minimizing the effect of soil disturbance for preparation and execution of testing
 - Performing at in situ conditions
(same stress conditions and relatively large volume of influential zone)
 - Generally not providing design parameters of soils directly but obtaining them by applying semi-empirical factors (or relations) to measured values.

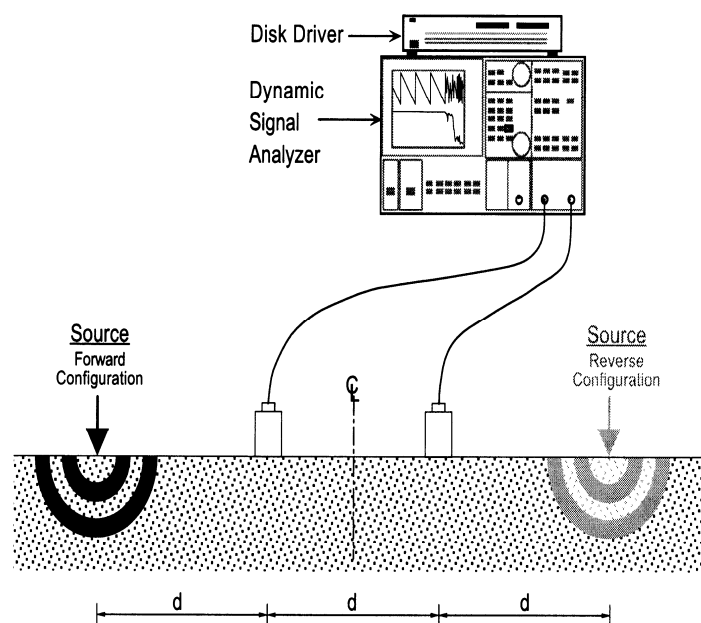
- The ways to obtain geotechnical informations in situ,
 - By using geophysical techniques
 - By using in situ borehole soil testing techniques
 - By making measurements using field instruments

- In more complex projects, it is common to determine strength and stiffness using both field and laboratory techniques (for example, a combination of SPT, self boring pressuremeter, field geophysics and laboratory stress-path tests with local strain measurements)

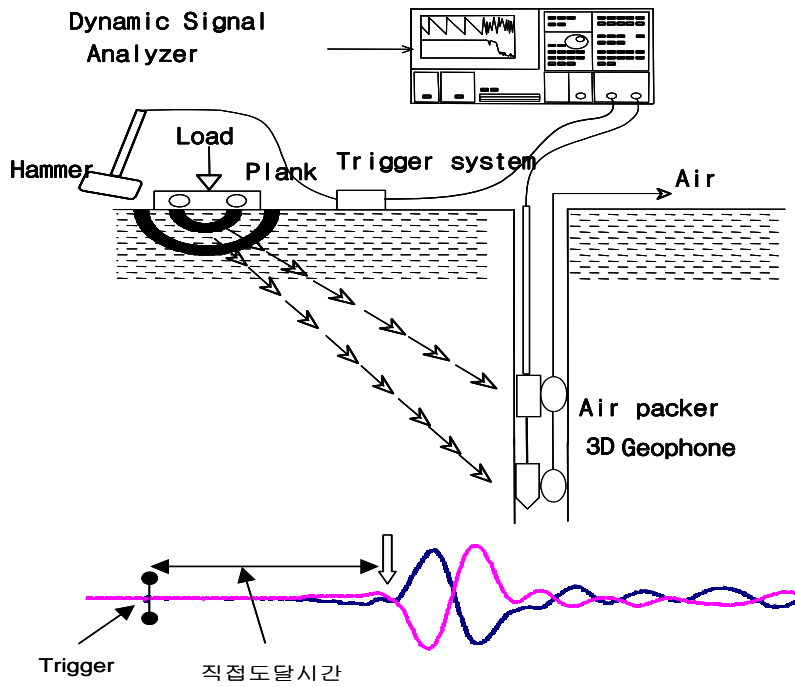
1) Geophysical techniques

- Approximate characterization of ground properties
(soil stratification with stiffness (elastic wave velocity et al))
- Cannot provide the direct measurements of the design parameters for geotechnical structures
- Types of geophysical techniques

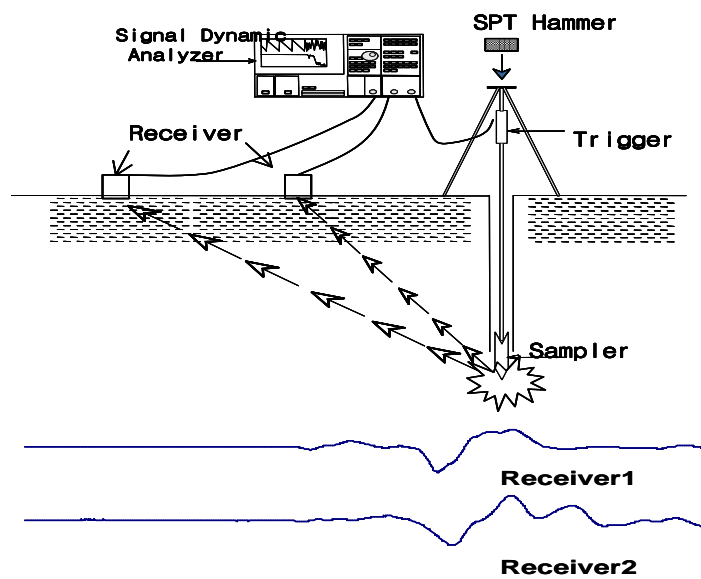
① Spectral Analysis of Surface Waves Measurements (SASW)



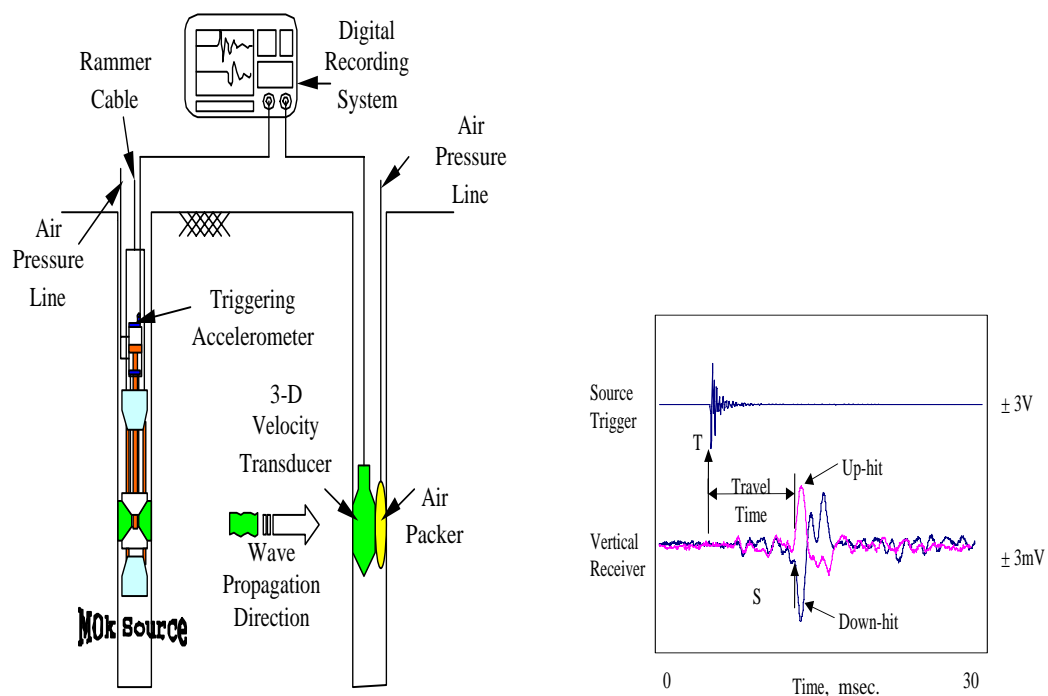
② Downhole Test



③ Uphole test

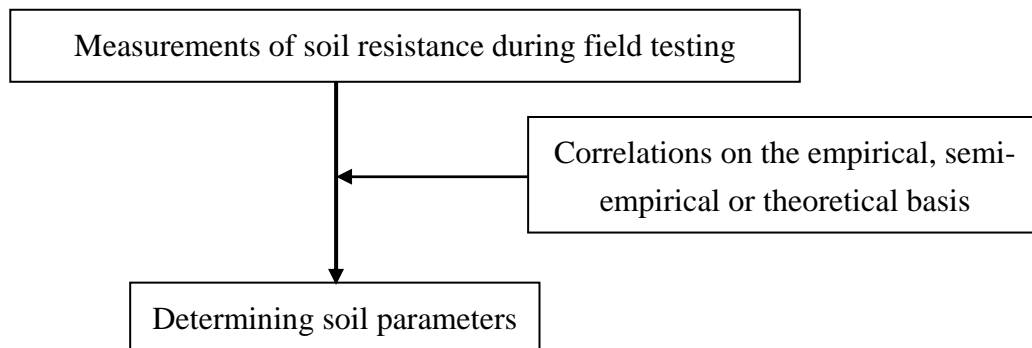


④ Crosshole test



⑤ Electrical resistivity survey

2) In situ borehole techniques



- Parameters from in situ tests with their comparative reliability (Robertson, 1986)

		Soil Parameters							
	Profile	u	ϕ	s_u	D_r	c_v	G	σ_h	$\sigma - \varepsilon$
CPTu	A	A	B	B	A	A	B	B	B
DMT	B	C	B	B	C	-	B	B	B
SPT	B	-	C	C	B	-	-	-	-
PBPT	B	-	C	B	C	C	B	C	C
SBPT	B	A	A	A	A	A	A	A	A
FVT	B	-	-	A	-	-	-	-	-

		Ground Type						
	Hard rock	Soft rock	Gravel	Sand	Silt	Clay	Peat	
CPTu	-	C	-	A	A	A	A	
DMT	-	C	-	A	A	A	A	
SPT	-	C	B	A	A	A	A	
PBPT	A	A	B	B	B	A	B	
SBPT	-	A	-	B	A	A	A	
FVT	-	-	-	-	B	A	B	

<Applicability>

- A : high
- B : moderate
- C : low
- : none