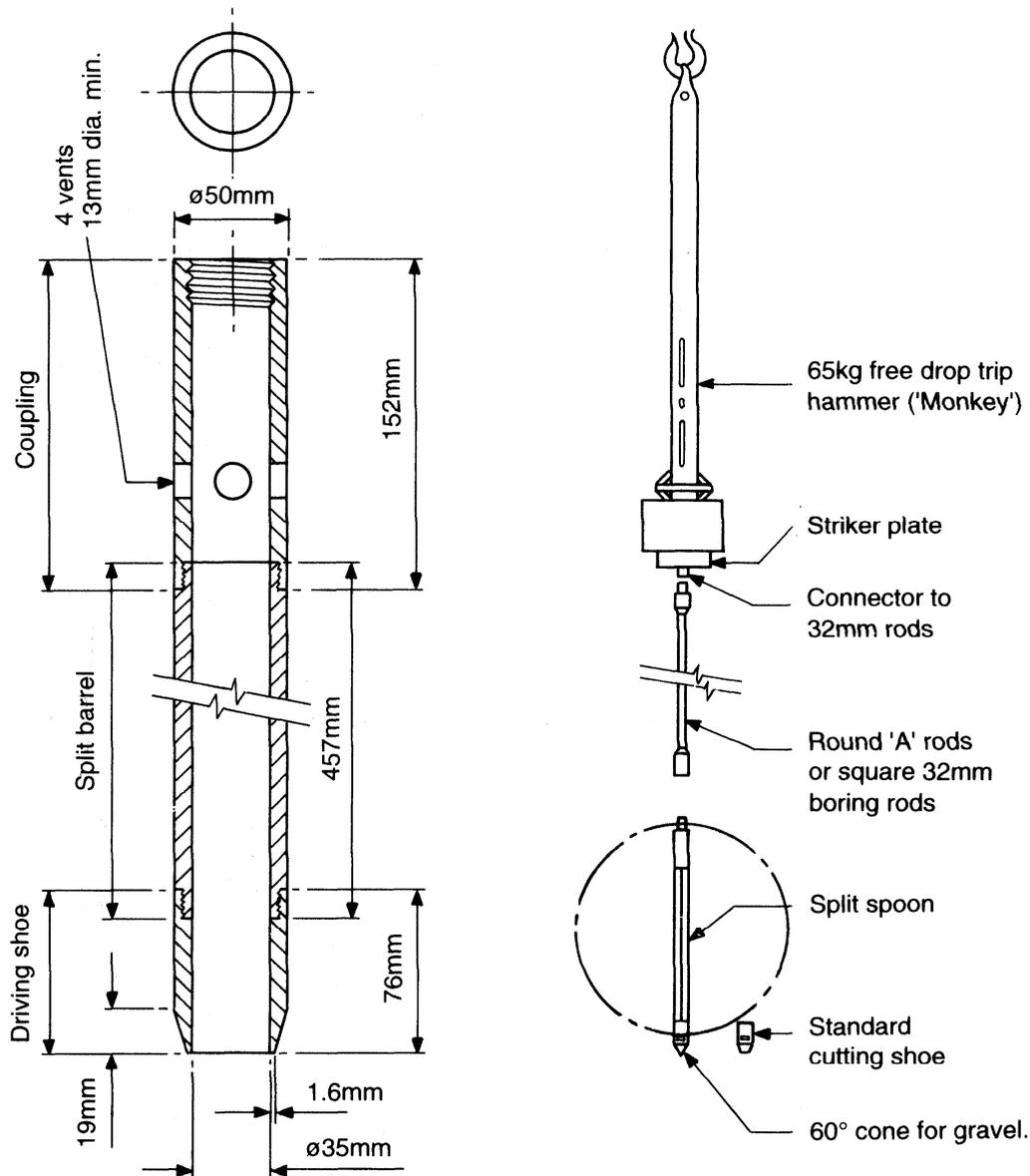


i) Thick-walled split barrel sampler (Split-spoon sampler)

⇒ Disturbed sample ($A_R=112\%$)

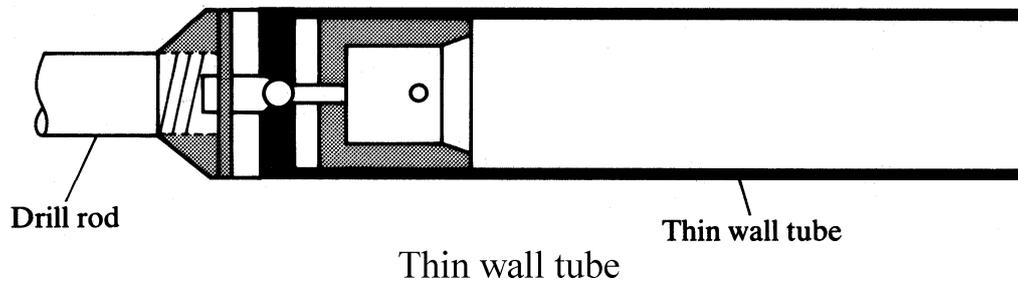
⇒ Split-spoon sampler is used during standard penetration test (SPT).

⇒ During SPT, the sampler is driven into the soil by repeated blows of a 65kg hammer falling freely through 760mm.



ii) Thin-wall open-drive sampler (Shelby tubing sampler)

- Pushing rather than hammering is preferred.
- Typically 750 – 900 mm long (or 612 – 762 mm long)
- Inside clearance : 0.5 – 1.0 % (or 1.0 – 1.5%)
- Internal tube diameter : 48 mm, 60 mm, 73 mm, 86 mm, 121 mm
- $A_R = 8 - 15 \%$ (decrease with increasing tube diameter)



iii) Laval Sampler

- One of the most effective tube sampler available for sampling soft and sensitive clays.
- Can obtain the sample of large diameter ($D=208\text{mm}$) with good quality.
- Consists of a thin-walled sampling tube within an external corebarrel.
- Bentonite slurry provides the support of borehole.
- No inside clearance.
- Area ratio: 10%

Ref) C.R.I. Clayton et al. "Site Investigation", pp. 377~380.

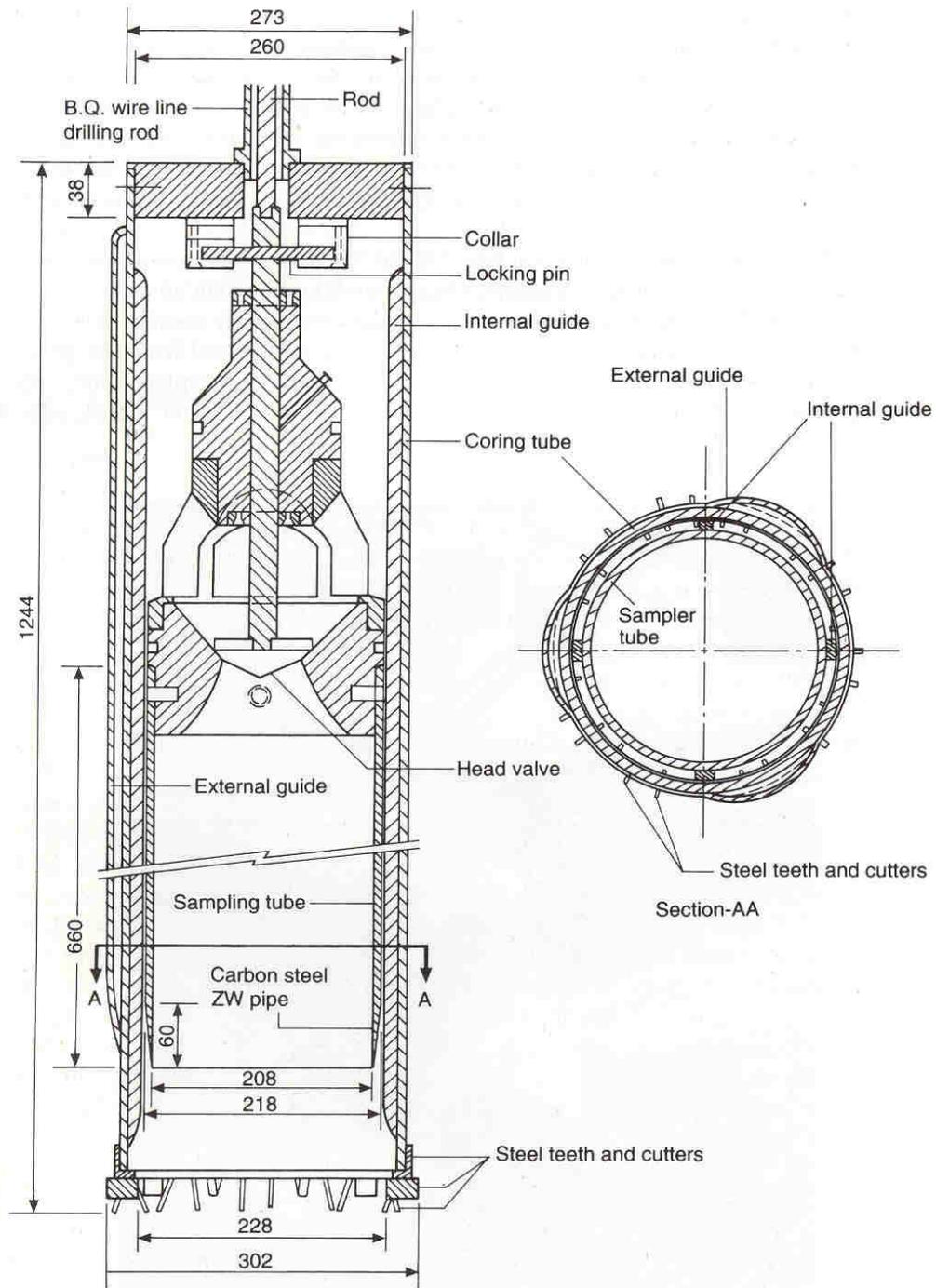


Fig. 7.9 The Laval 200 mm diameter tube sampler (La Rochelle, Sarrailh, Tavenas, Roy and Leroueil 1981).

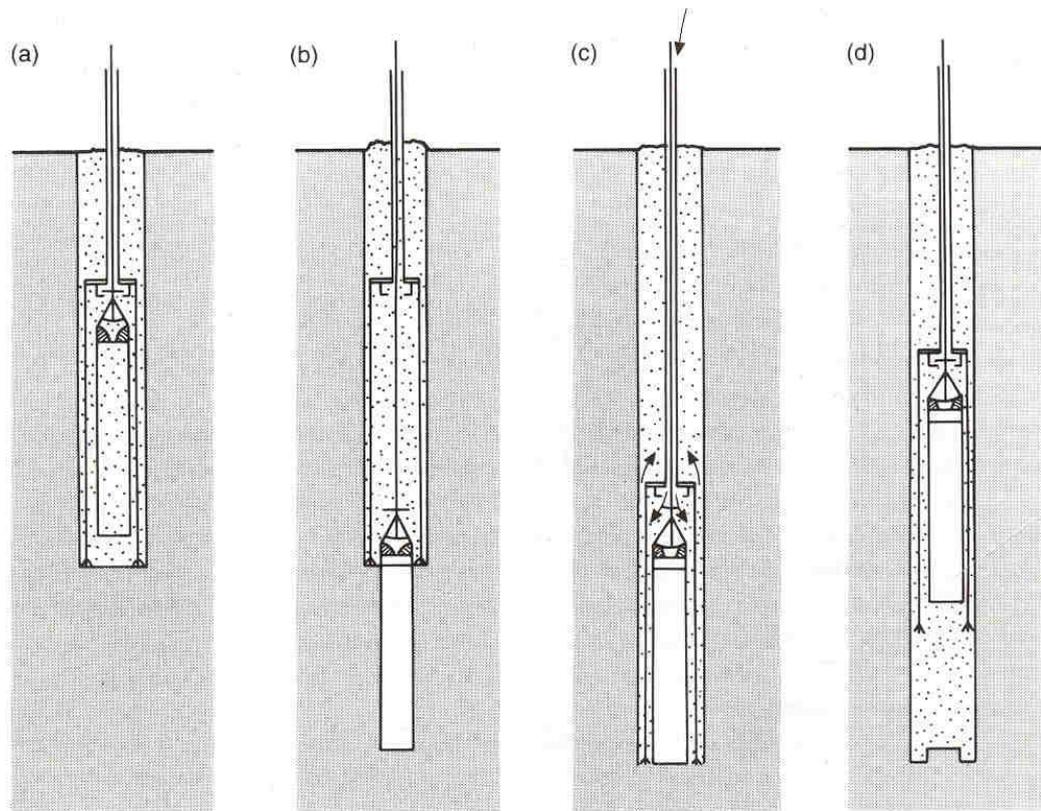


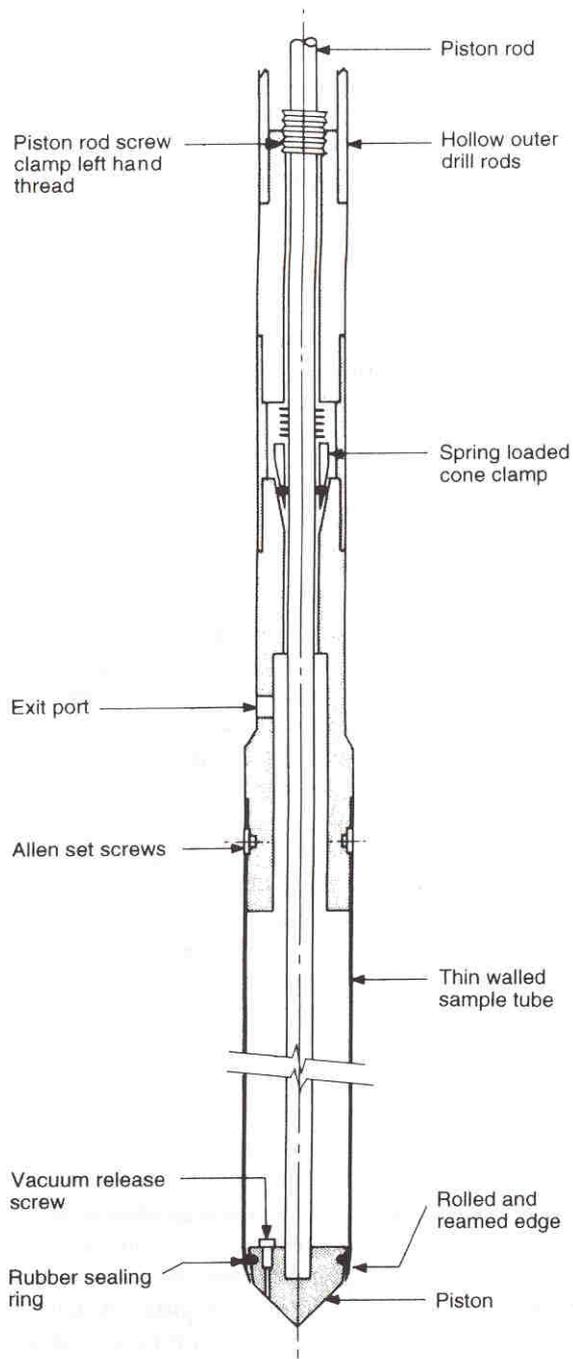
Fig. 7.10 General operation of the Laval sampler (La Rochelle *et al.* 1981).

b) Piston sampler

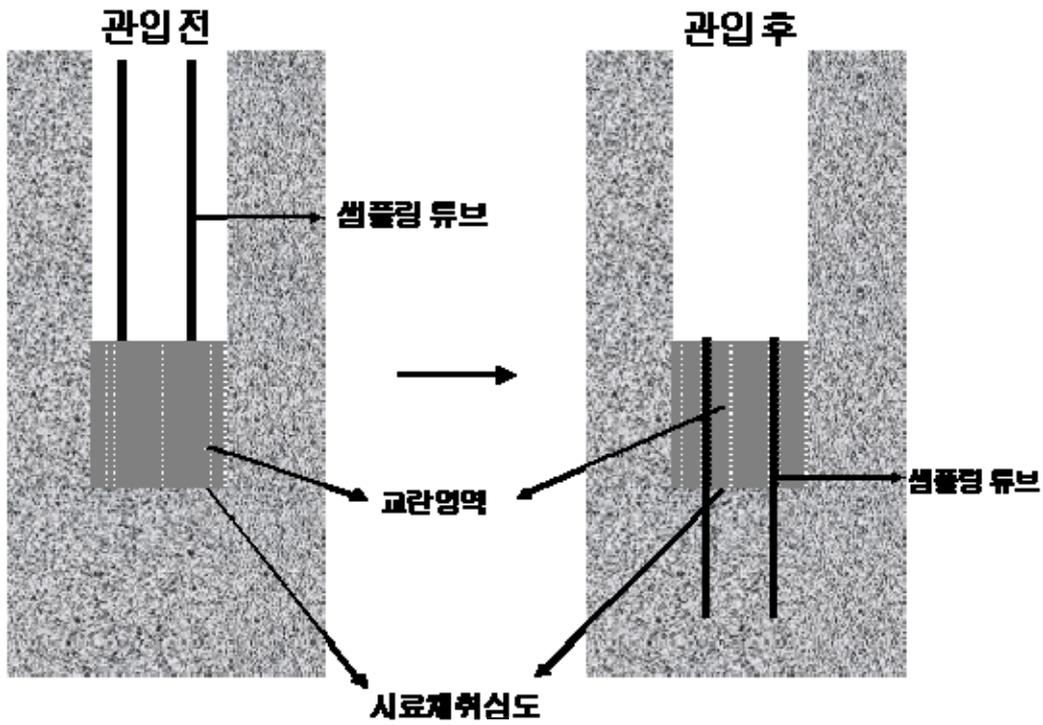
- Can obtain larger diameter samples with better quality than thin-wall open driver sampler.
- Has a piston contained within the sampler tube, which is moved upwards relatively to the sample tube.
- Types of piston samplers
 - i) Free Piston Sampler: Piston is fixed during driving and withdrawing of the sampler, but free when the sampler tube is being pushed into the soil.
 - ii) Fixed Piston Sampler : Piston is fixed at each 3 stages (driving and withdrawing the sampler and pushing sampler tube).
 - iii) Retracted Piston Sampler : Piston is fixed only during driving the sampler and then piston is retracted to the top of the tube.

Fig 7.12 in p.383 (next page)

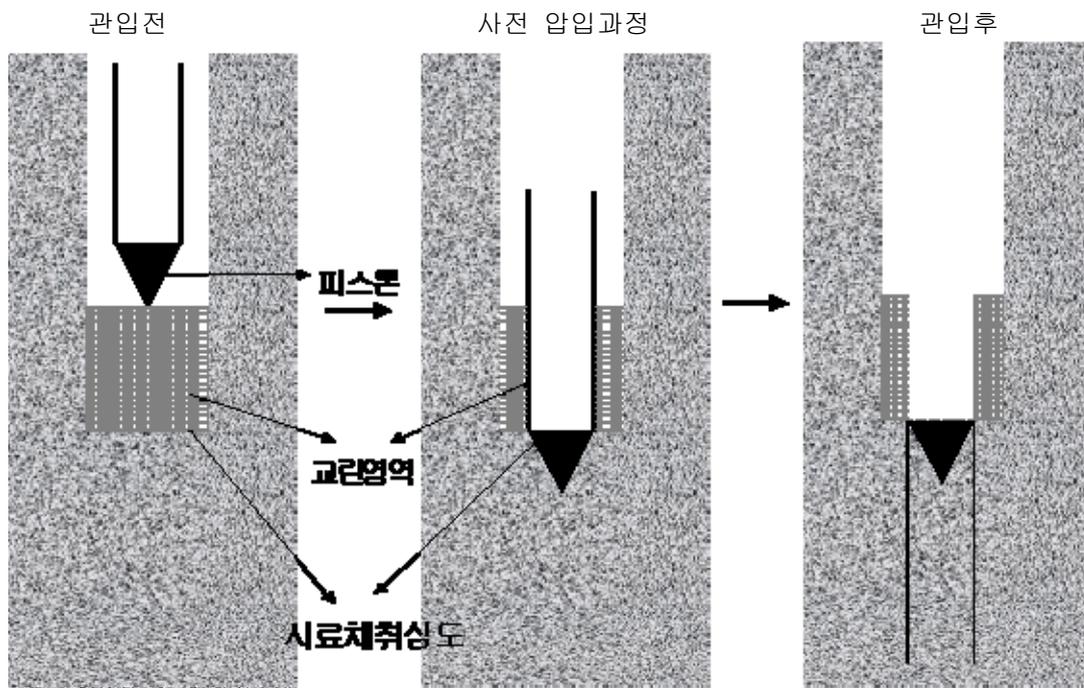
- Advantages based on fixed piston sampler
 - i) Can prevent soil (which is remolded) entering the sampler tube before the sampling position is reached.
 - ii) Can reduce losses of samples, by providing an efficient airtight seal to the top of the soil in the tube during withdrawal.
 - iii) Can reduce the excess soil into the tube during driving sampler tube.
 - iv) Can reduce the possibility of blocking the tube by soil samples in it. (Can increase the acceptable length to diameter ratio.)



7.12 Thin-walled seamless steel tube fixed piston sampler.

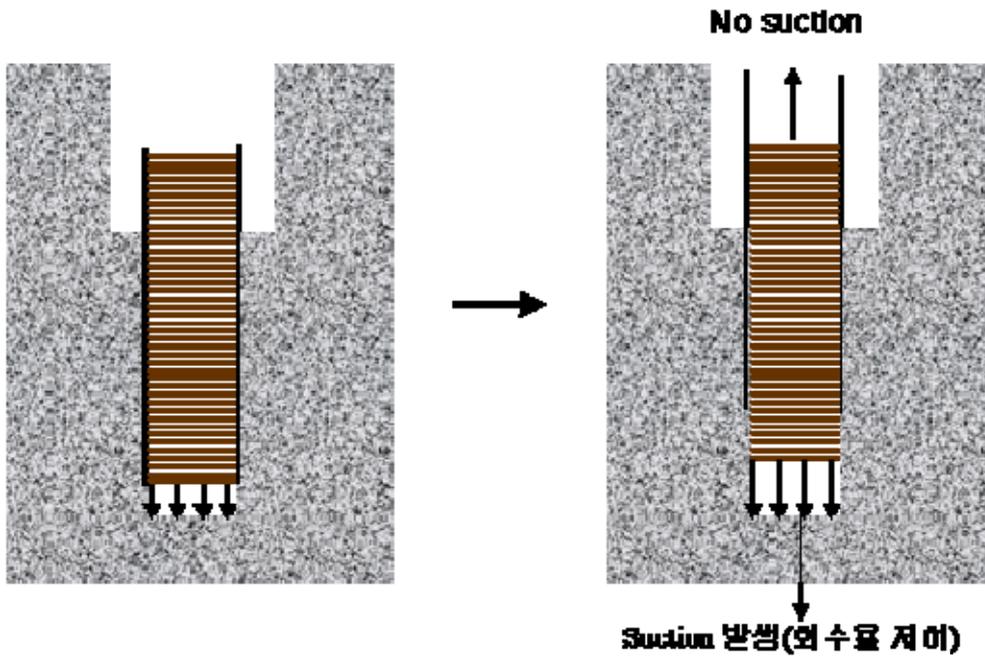


(a) Open drive sampler

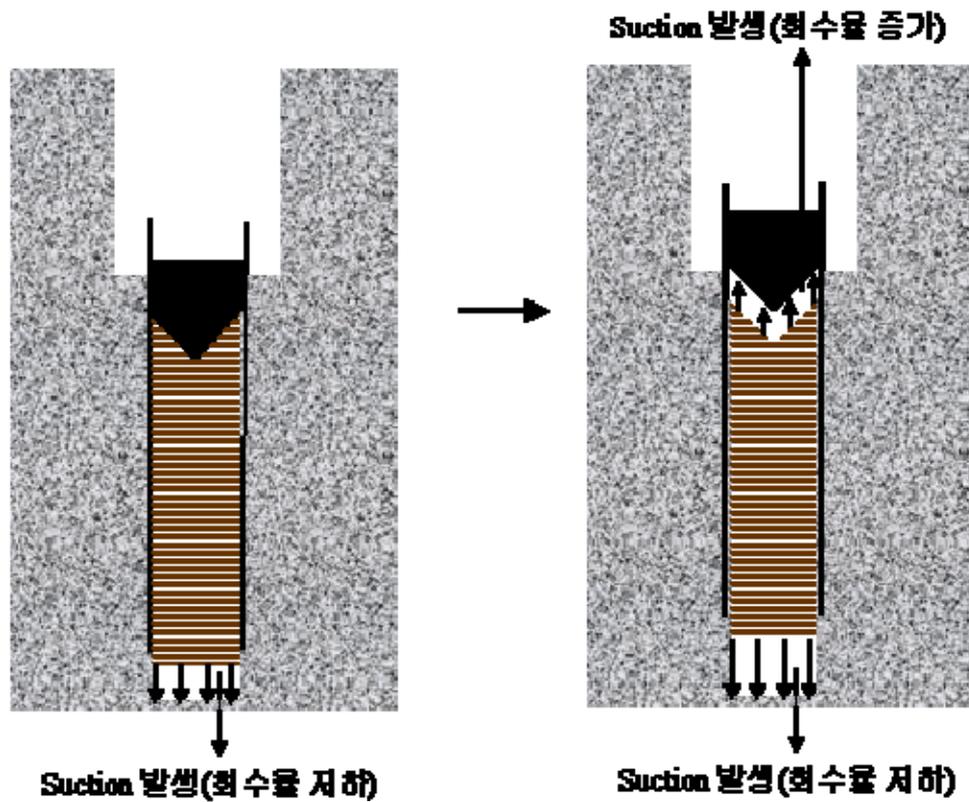


(b) Piston sampler

그림 . Piston sampler 의 사전 압입과정 (case 1)

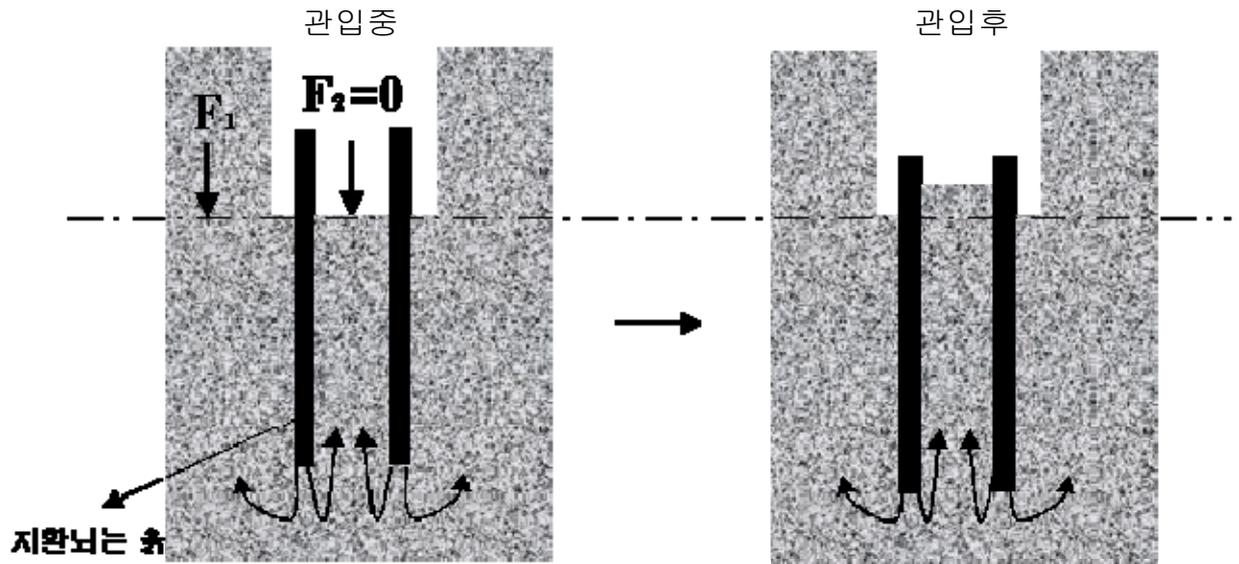


(a) Open drive sampler

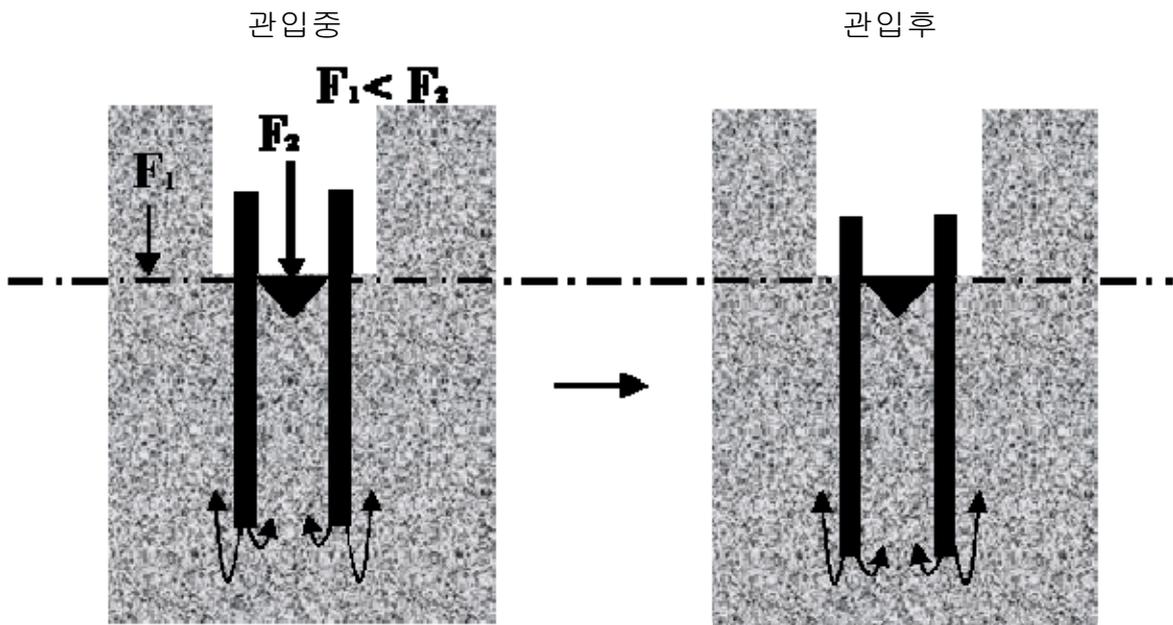


(b) Piston sampler

그림 piston sampler 의 회수 (case 2)



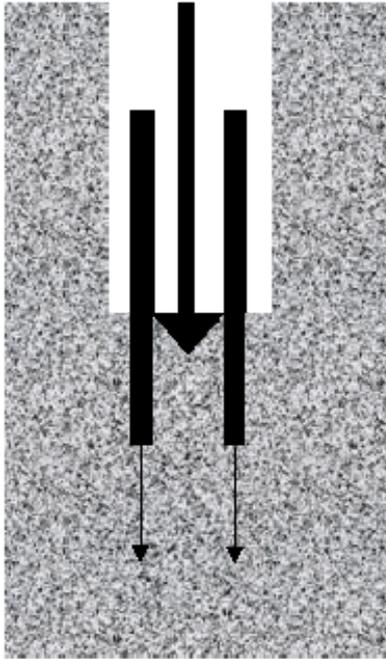
(a) Open drive sampler



(b) Piston sampler

그림 piston sampler 의 관입 (case 3)

폐색이 발생하지 않는 경우



폐색이 발생하는 경우

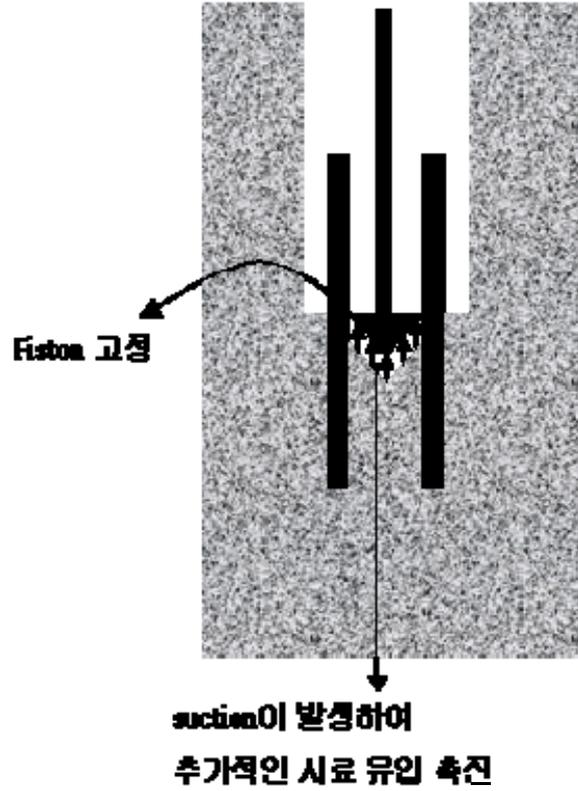


그림 Piston sampler 의 폐색 (case 4)

- Note

(Chung et al. (2003), Geotechnique 53)

For the sampling tube of 73.8mm I.D. (NX size) and 854mm length in hydraulic piston sampler (1.2mm wall thickness and 6° of cutting edge taper),

⇒ the top 30cm length of the sample is subjected to experience significant disturbance, due to the high drilling pressure (high hydraulic pressure) and the remainder of slurry (slime).

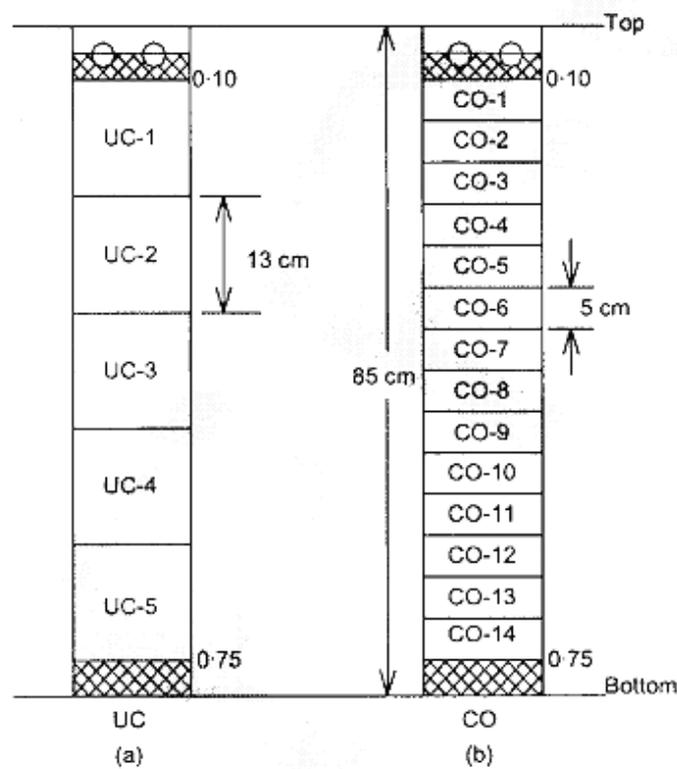


Fig. 2. Position of specimens in a sample tube: (a) UC test; (b) CO test

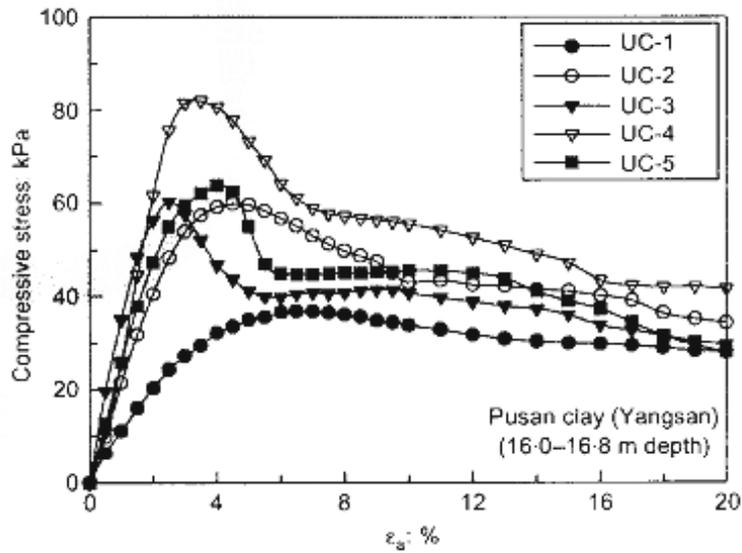


Fig. 3. Relationship of compressive stress against axial strain in UC test

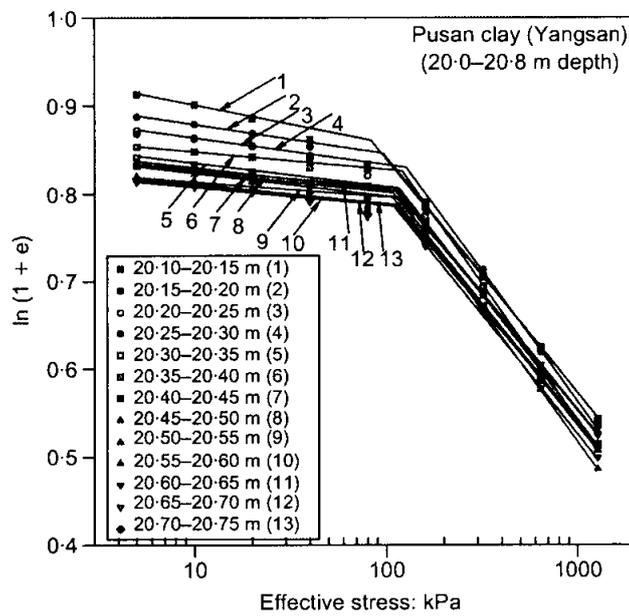
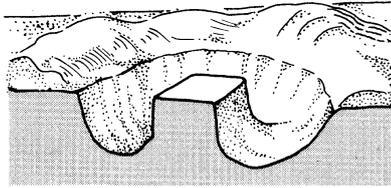


Fig. 4. Plot of $\ln(1 + e)$ against $\log \sigma'_v$ for samples between 20.0 m and 20.8 m depths

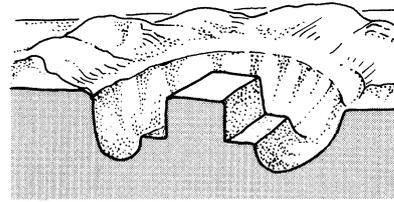
2. Block Sampling

- The sample is cut from the ground, either from the base or side of a trial pit.
 - i) Involving the careful hand excavation of soil around the sample position and the trimming of a regular-shaped block.
 - ii) Sealing soil block with layers of wax.
 - iii) Encasing it into the box, cutting sample bottom and placing wooden lid.

- Block samples undergo stress relief, and swelling, but should not be subjected to severe shear distortions.

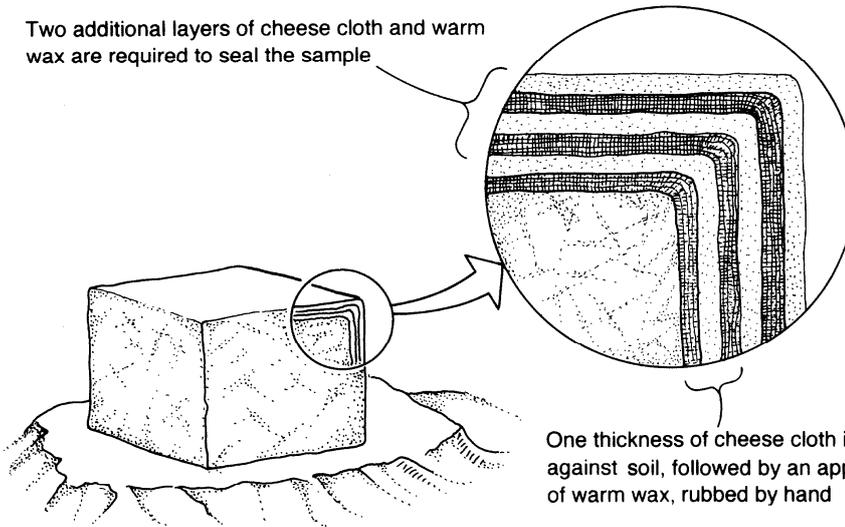


(a) Level ground surface, mark outline of sample and carefully excavate trench



(b) Deepen excavation below base of sample, and trim to size with a knife

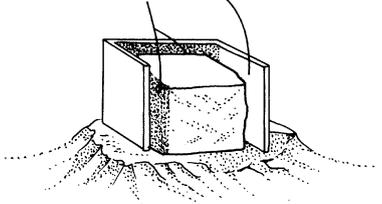
Two additional layers of cheese cloth and warm wax are required to seal the sample



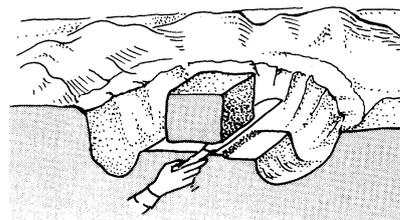
One thickness of cheese cloth is placed against soil, followed by an application of warm wax, rubbed by hand

(c) Seal with three layers of cheese cloth or plastic foodwrapping, waxing each layer by brush, or hand

fill space between sample and box, to provide support



(d) Encase sample in a wooden box, packed with foam or damp woodshavings, if soil is easily disturbed



(e) Cut sample from bottom of pit, and seal base as in (c). Place wooden lid, if box is used

Block sampling

3) Sand sampling

- The structure of sand is highly dependent both on stress history and current effective stress level. Small changes in shear stress can destroy its present state, leading to considerable reduction in stiffness.
- Undisturbed sand sampling can be very expensive and is not generally used.
- Freezing method

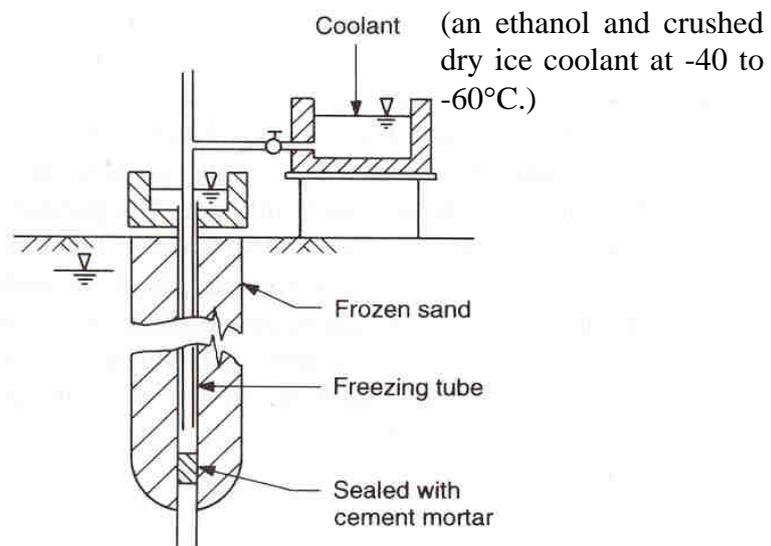


Fig. 7.21 Method of sand sampling by freezing adopted by Yoshimi, Oh-Oka (1977).