

# BUILDING DIGEST

CENTRAL BUILDING RESEARCH INSTITUTE INDIA



## UNDISTURBED SAMPLING OF SOILS

### The Object of taking Undisturbed Samples

Soil samples are defined as "undisturbed" when they are taken with such care that the least possible disturbance is caused to the structure of the soil. When samples are taken by such methods as auger boring, though the soil is collected in its entirety without any loss of constituent fractions, the structure is completely altered and as such, the properties of the soil that depend on it.

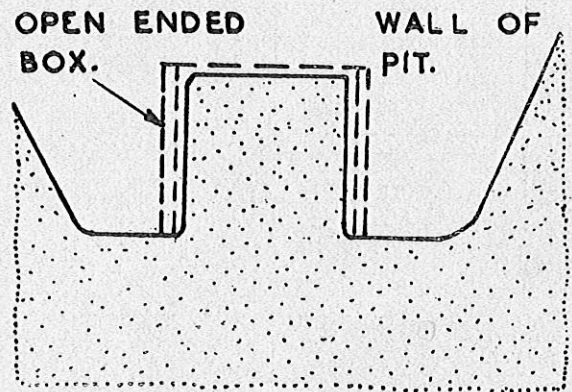
Undisturbed samples are necessary if it is required to determine such properties as shear strength, compressibility, void-ratio etc., which depend on soil structure and are applicable to the undisturbed ground. These properties have to be determined in order to evaluate the bearing capacity, settlement under load, stability of cuts and other soil characteristics required for design purposes. Results obtained using disturbed samples if applied to in-situ ground conditions will obviously be erroneous.

### Box samples

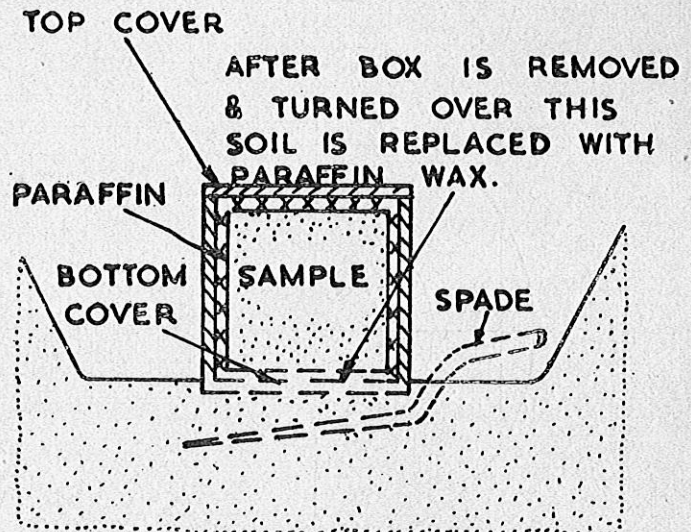
An open pit is the best means of obtaining an undisturbed soil sample. Its size will depend on the type of the soil and the slope at which the side walls will stand unsupported, but a 1 metre square (about 3 ft. square) working area at the final depth of sampling should be ensured. After reaching the desired depth the surface is levelled and all loose material removed. A 20 to 30 cms. (8 to 12 in.) cube of soil is then cut out carefully from the bottom by digging a narrow trench all round, a little in excess of the desired depth of the cube with the help of a crowbar or a long bladed *mali's khurpa*. A wooden box, open at both ends and slightly larger than the soil cube is next lowered on the cube. A little soil is scraped from the top and the empty space and the sides are filled with molten paraffin wax. The wooden lid is then gently fixed with screws. The bottom of the cube is next sheared off by pushing a large knife or the blade of a spade underneath (fig. 1). The operation is similar to removing a plant with the soil around its roots undisturbed. The soil sample along with the wooden box is next inverted and a little soil trimmed off the bottom of the sample. The operation is completed by filling in molten wax and fixing the lid with screws.

### Tube samples

If samples have to be obtained from a depth in excess of 3 metres (10 ft.) or below the water table,



A - SOIL COLUMN ISOLATED

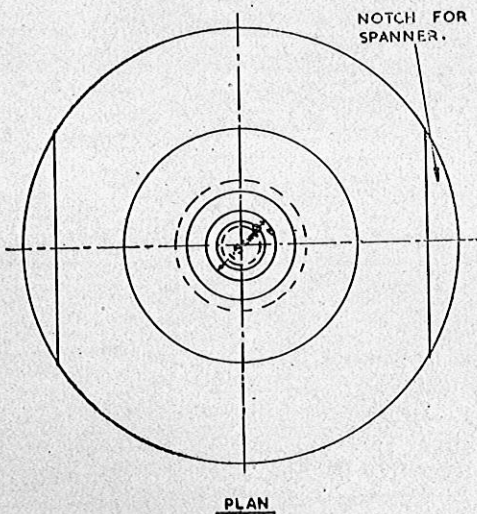
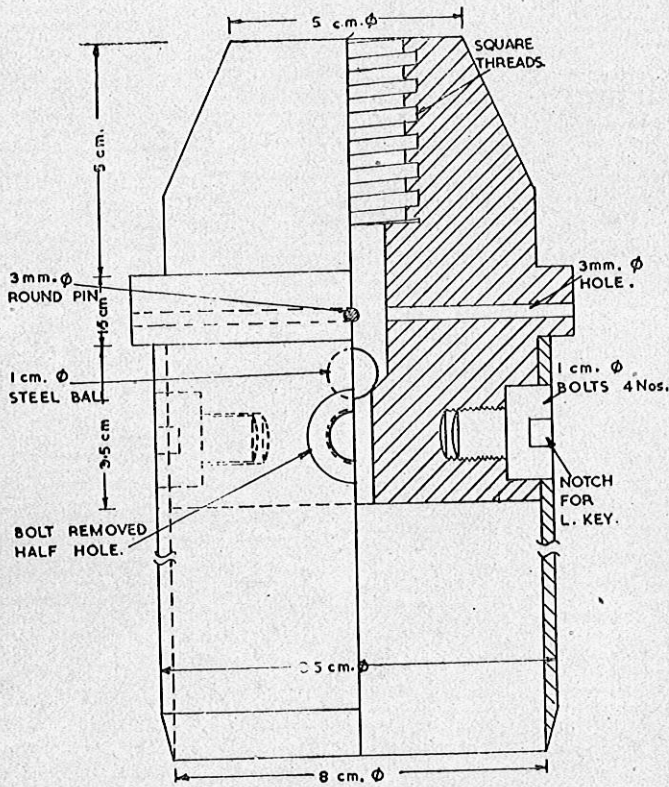


B - SAMPLE ENCASED

FIG 1 BOX SAMPLING

box samples are not easy to obtain unless the water table is first lowered by pumping. However, samples of cohesive soils can still be obtained with the help of very thin seamless steel tubes of about 8 to 10 cm. dia.

and 40 cm. long. One end of the tube should be sharpened to a cutting edge and the other end should be fitted to a suitable head assembly to which drill rods or extension rods can be screwed. A typical head assembly is shown in fig. 2 and can be turned out of a solid m. s. round.



HEAD ASSEMBLY WITH SAMPLER

FIG. 2

To obtain undisturbed samples the bore hole is first advanced to the required depth by normal tube-well operation making use of a casing pipe, tripod and a sand-bailer. In certain cohesive soils where the

soil does not cave-in, an auger (Fig. 3) may be used to make the bore hole and the casing pipe etc. may be

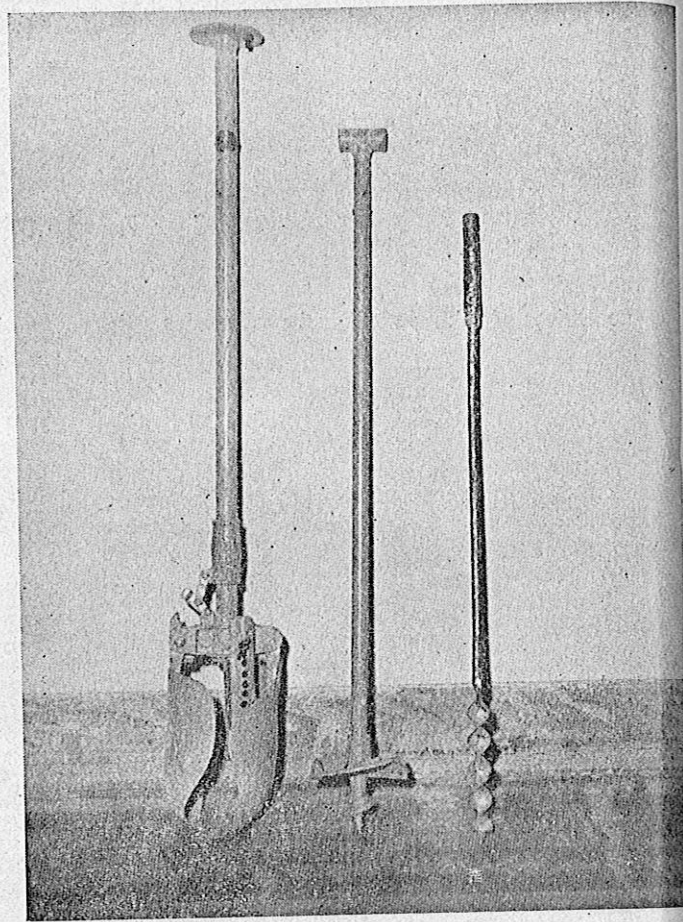
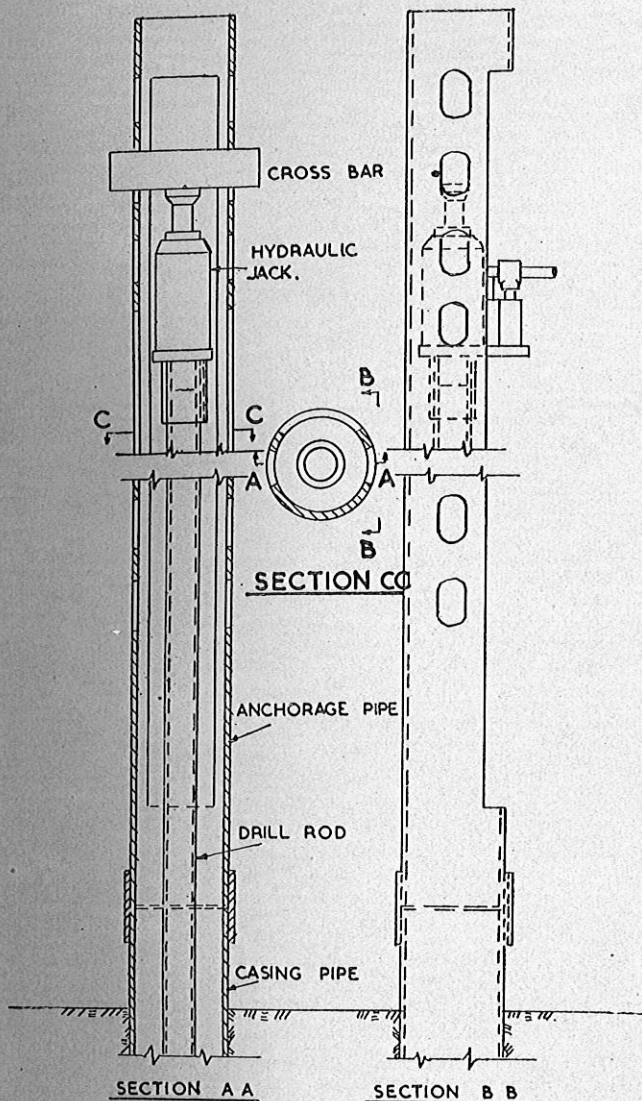


Fig. 3

omitted. The sampling tube is next lowered into the bore hole with the help of drill rods or ordinary 2 cm. G. I. pipes and steadily pushed down to a distance of 40 cms. Direct blows from a hammer or falling weight should be avoided as far as possible and a hydraulic or screw jack should be used. A suitable assembly for this purpose is shown in fig. 4. Over-driving of the tube should also be avoided as it is likely to compress and distort the sample. The sample should be sheared off by giving a slight twist to the drill rods and the sampler gently removed from the borehole. A small quantity of soil should be trimmed off from the lower end and the space filled with molten paraffin wax. The head assembly should then be removed and the empty space in the tube at the upper end sealed with wax.

#### Packing and Transport

The box or the tube sample should be carefully wrapped in hessian cloth and packed for despatch in a large wooden box (maximum of 2 box samples or six tubes in one package) with a cushion of wet saw-dust or some other suitable packing material all round. If a suitable packing material is not available, moist soil



MOHR JACKING ARRANGEMENT

FIG. 4

from the pit itself may be used but care should be taken that the crate is lined with tough paper or other suitable material to prevent the escape of loose soil.

#### Precautions

The following general precautions are to be taken :-

- (a) Carry out sampling immediately after the pit is dug.
- (b) Do not expose the surface from which the soil sample is being obtained to sun, rain or strong wind.
- (c) Store the soil sample in a cool and humid place after taking it out of the ground and before it is despatched.
- (d) Wherever possible, send samples to the laboratory with a messenger who can ensure that the package is not subjected to jolts and rough handling during transport.
- (e) Provide data sheet with each sample giving complete details regarding location, depth, date of sampling and name of the project. Put one data sheet inside the box and tag on another outside.
- (f) Mark the top of sample clearly on the sample as well as on the box or the tube.

*There is a demand for short notes, summarising available information on selected building topics for the use of Engineers and Architects in India. To meet the need this Institute will bring out a series of Building Digests from time to time and the present one is the seventh in the series.*

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