I c 8

INFLUENCE OF THE CONSOLIDATION IN THE CLAY BY THIXOTROPY AND ITS REACTION ON THE SHEARING RESISTANCE

WALTER BERNATZIK, Innsbruck, Austria

Experiments from Hauser 1) have resulted that in water rich suspensions or in colloidal solutions the Brown's movement of the particles is diminuating by increased addition of electrolytes until they finally rest quietly side by side and only a glittering is showing that the particles are still rotating. By adding still more, the glittering stops abruptly and the suspension coagulated into a gel. By this is shown that the electrolytes form forces on the surfaces of the grains which is the cause that the neighbour water molecules form a film. This film surrounds the grains like an envelope which is solidly connected to it and the thickness of this envelope increases with adding electrolytes. Therefore the following conclusion can be drawn:

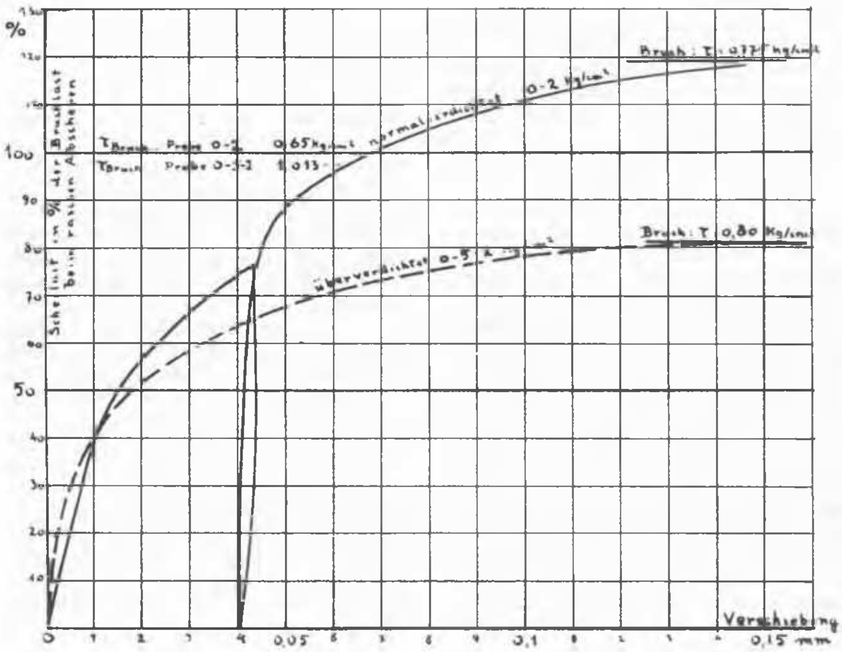

FIG. 1

If a clay of which the above mentioned can be said is submitted to a consolidation, water can only be pressed out when the hydraulic gradient is sufficient to surmount the forces on the surfaces of the grains which tear the water molecules in a film. Otherwise the pore-water streaming of the consolidation comes to a premature stillstand and it can only continue, when the water contained in the film becomes liquid again by reasons such as oscillation or deformation.

When a normally compressed and consolidated clay sample which stands at the end of a compression progress is submitted to shearing tests under otherwise equal conditions, greater resistances must be resulted in a slow test (several weeks) than in a quick test (10 min) This does not only happen because the sample has in the first case more time to consolidate under the increased shearing tensions but because the water of the films remains liquid by the slow shearing deformation, which makes an additional consolidation possible. The proof is given by the over-compressed sample which stands at the end of a swelling progress and which consequently must result a smaller shearing resistance in the slow test than in the quick test because the water becoming solid interrups the end of the swelling progress. Therefore such a sample is swelling during the test and its shearing resistance decreases.

The ill. shows the results of the tests madè by the author. Four equal samples of a very plastic clay from Upper Selisia (index of plasticity more than 100) were examined in a thermostate room in Casagrande's shearing apparatus. The first two samples consolidated with 2 kg/cm^2. The next two samples were over-compressed with 5 kg/cm^2 and discharged to 2 kg/cm^2. The consolidation periods were very long so that the four shearing tests took place not earlier than four months afterwards.
From each category one sample was submitted to a quick shearing test (10 min) and the result was the following; normally compressed sample (0 - 2) a shearing resistance of 0,65 kg/cm^2, over-compressed sample (0 - 5 - 2) 1,013 kg/cm^2.

Contrary to this slow shearing tests (3 weeks) gave the following results: normally compressed sample (0 - 2) 0,775 kg/cm^2, i.e. 19% more, and overcompressed sample (0 - 5 - 2) 0,80 kg/cm^2 i.e. 20% less, than in quick tests.

In clays which are at the end of a compression progress a slow deformation, contrary to a quick one, causes an increased shearing resistance. In clays which are at the end of a swelling progress it is just the contrary. This influence has to be the stronger the more the thickness of the films i.e. the placisity of the clay increases.

REFERENCE

1) Kolloidzeitschrift 1929, B48, H.1.

-o-o-o-o-o-o-