

The action of frost on foundations

In the international scientific community of those who work on the effects of frost on foundations, the LSM is considered at the present time to be a reference laboratory due to the numerous and important research projects which have taken place in this domain since approximately 1940. The laboratory is currently less active in research in this field, but it is useful to recall, in the following text, some of the results obtained over the last years.

In the roadway construction sector, the LSM has been especially concerned with:

- the behaviour of frost and thaw on roadway pavements constructed with traditional or innovative materials such as stabilised with cement or crushed gravel
- the perfecting of test procedures for the determination of the sensitivity of the subgrade and pavement materials to frost
- frost design methods and especially the effect of solar radiation

A special test installation, which permitted the year round simulation, under laboratory conditions, of the effects of severe winters on fullscale roads (Figure 1) enabled the execution of numerous tests with different superstructures and frost conditions.

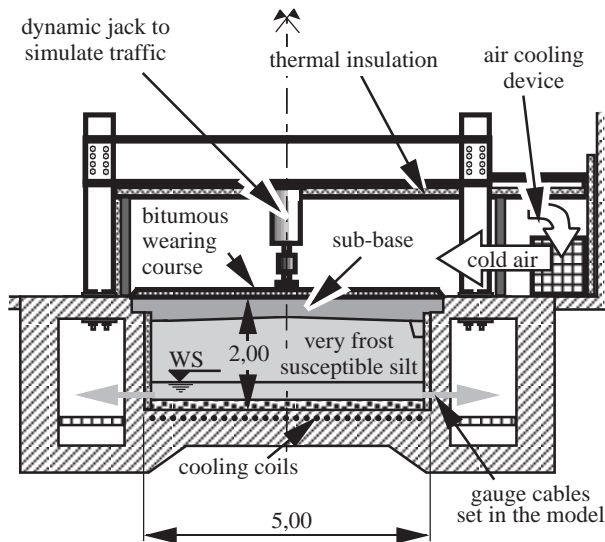


Figure 1: Section of test installation

Main publication

M. DYSLI, 1991 *Le gel et son action sur les sols et les fondations*. Presses Polytechniques et Universitaires Romandes, Lausanne, 250 pp. Prix Henri-Courbot 1993.

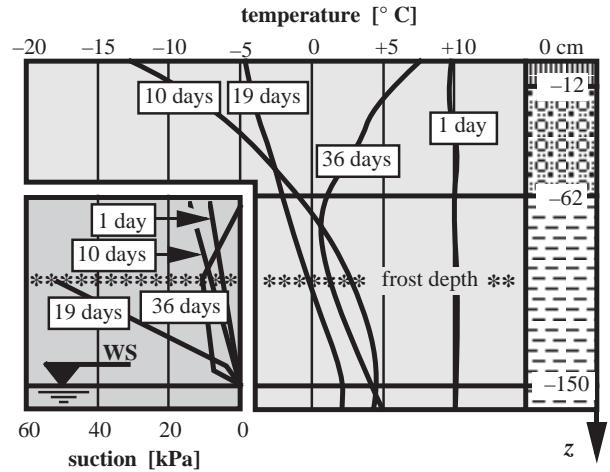


Figure 2: Evolution of temperatures and corresponding capillary suctions

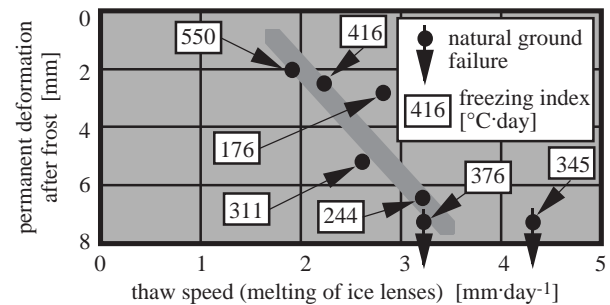


Figure 3: Influence of the frost speed on the bearing capacity of a roadway founded on a frozen infrastructure

These tests were used as a basis for new Swiss standards for road design which bring about substantial savings in the domain of frost design. They have, in addition, permitted the measurement for the first time of the development of capillary suctions in a full-scale frozen infrastructure (Figure 2) and the establishment of a correlation between the bearing capacity and the thaw speed (Figure 3).

Concerning the procedures for determining the frost susceptibility of soils, the LSM has perfected a new test which combines the measurement of frost swelling and the measurement of decrease in bearing capacity by CBR penetration, a test which is currently standard in Switzerland and recommended at the European level (CEN).