

INTERNATIONAL SOCIETY FOR SOIL MECHANICS AND GEOTECHNICAL ENGINEERING



This paper was downloaded from the Online Library of the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE). The library is available here:

<https://www.issmge.org/publications/online-library>

This is an open-access database that archives thousands of papers published under the Auspices of the ISSMGE and maintained by the Innovation and Development Committee of ISSMGE.

Messrs. MAYER

Inspecteur Général des Mines

GUILBERT

Ingénieur aux Laboratoires du Bâtiment et des Travaux Publics.

SYNOPSIS OF THE FRENCH REPORT1. THE PROBLEM, CORRUGATION.

- a) It has long been proved by experience that on plain tracks on the natural soil of desert or semi-desert country there occur over considerable distances, regular undulations at intervals of about one metre (3'3"). These ridges are several centimeters in height and cause considerable embarrassment to motor traffic.
- b) Corrugation occurs in the zones where the natural ground is composed of gravel bound by a sandy clay cement. As a result of alternate cold and heat the cement is loosened, the fine elements are carried away by the wind, leaving loose materials, sand and coarse stone.

2. SMALL SCALE TRIALS.

The observations made in the field suggested that the phenomena should be reproduced on a small scale in the Paris Manège (treadmill). The Paper will give a brief description of this experiment.

A soil as similar as possible to that studied in Africa was laid out on the track.

The tests gave rise to the following observations:

- a) The period of undulation corresponds to the period of oscillation of the non suspended parts of vehicles travelling at an average speed. The period of the springs or the presence of shock absorbers are without effect on the corrugation.
- b) Corrugation only occurs in loose, dry material on a hard subgrade. A damp atmosphere such as that obtaining in France during the frequent autumn fogs is sufficient to prevent it.
- c) Slow motion films show that corrugation originates in the displacement on a hard subgrade and results from the rolling of elements of medium size, drawn to and thrust away from the tire. If the subgrade is not hard these are only rolled end integrated into the track. If the elements are too coarse the wheel cannot pick them up and displace them. If they are too fine they are thrust aside and a rut is produced, baring the natural subgrade. The presence of elements of diameter between 5 and 25 mm. (1/5" and 1") seems indispensable to the formation of undulations.
- d) The stiffness of springs, on the contrary, has a very decided influence on the corrugation.

By limiting the play of the springs the corrugation resulting from certain types of wheel has been completely eliminated.

e) Besides the relative stiffness of the springs the degree of tire inflation is a very important factor in the process of corrugation. On a gravelly surface, the softer the tires, the more they provoke corrugation.

But, on the contrary, solid tires produce corrugation very quickly on small gravel while, on the other hand, soft, under-inflated tires have no effect.

f) In any case, corrugation is very definitely influenced by the speed.

Below 20 km. per hour (13 mph.) there is practically no formation of undulations. During the experiments at the treadmill the rapidity of formation increased as the speed rose from 20 to 50 km. per hour (13 to 31 mph.) the latter being the maximum.

3. FIELD TESTS.

During observations of given stretches of trans-Saharan track, the authorities of the Mer-Niger railway checked the data obtained in the treadmill. It has been established that if there is no bituminous binder available to make a road surface, however thin it may be, stabilisation according to grain size accumulation curves should be absolutely ruled out in very dry regions.

On the other hand, good results were obtained on stretches covered with fine material such as silt, marly tuff, clay, etc. . The excellent results obtained on stretches covered with laterite clay are particularly instructive.

CONCLUSION

The experiments undertaken in 1942 and continued after the war have thrown a certain amount of light on the conditions that bring about corrugation and indicated certain measures suitable to correct them.

These measures are:

- a) For vehicles: specification of hard springs and hard inflated tires.
- b) For the track: reduction of the loose surface elements. The use of silty or clayey material which resists the freeing of gravel is to be recommended with this object.