TECHNICAL REPORT 8350

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Road vehicles — High-friction test track surface — Specifications

Véhicules routiers — Surface de la piste d'essais d'adhérence élevée — Spécifications

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The main task of ISO technical committees is to prepare International Standards. In exceptional circumstances a technical committee may propose the publication of a technical report of one of the following types :

— type 1, when the necessary support within the technical committee cannot be obtained for the publication of an International Standard, despite repeated efforts;

— type 2, when the subject is still under technical development requiring wider exposure;

— type 3, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical reports are accepted for publication directly by ISO Council. Technical reports types 1 and 2 are subject to review within three years of publication, to decide if they can be transformed into International Standards. Technical reports type 3 do not necessarily have to be reviewed until the data they provide is considered no longer valid or useful.

ISO/TR 8350 was prepared by Technical Committee ISO/TC 22, *Road vehicles* with ISO/TC 31, *Tyres, rims and valves* and the PIARC technical committee on road surface characteristics.

The reasons which led to the decision to publish this document in the form of a technical report type 2 are explained in the Introduction.

0 Introduction

0.1 Historical background

During its work to establish vehicle handling test methods, subcommittee ISO/TC 22/SC 9, *Vehicle dynamics and road-holding ability* found a need to establish a method of evaluating the friction characteristics of a test surface for handling tests related more to peak friction than to the widely-used ASTM locked-wheel procedure.

The reason for this is that peak lateral and longitudinal friction determines the limits of handling and braking performance. Furthermore, research has shown that there is no general correlation between these properties and locked-wheel friction.

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It was also considered desirable to establish a standardized test surface for high-friction tests and perhaps later also for low-friction tests : the work started with a "state of the art" survey.

Concerning the task of establishing a high-friction standard test surface, the survey indicated that a surface treated with silica sand bonded to the surface by a bitumen-expanded epoxy binder was the best solution.

The basic philosophy behind the proposed test surface was that it should be a surface treatment that could be laid on existing test tracks and that the friction characteristics should depend almost entirely on the aggregate which had to be as wear-resistant as possible. The task of the binder should be to keep the aggregate bonded to the original surface. Such a surface had been developed and used for some years by a large tyre manufacturer and was recommended to the working group as a suitable proposal for a standard high-friction test surface, which was accepted by (working group) WG 3 as being the most advanced current "state of the art".

The aggregate was rounded quartz sand from a large natural source in the United Kingdom representing the most wear-resistant material known in a polished form for road construction. Originally, a 50:50 bitumen-expanded epoxy binder was used. Experts in the field did however recommend that the proportions should be left to local expertise as climatic conditions and the base on which the surface was laid could require different percentages for good results.

In the USA similar surfaces, also with silica sand aggregate bonded to the base with bitumen-expanded epoxy binder, have been used since 1974 as reference friction surfaces for calibrating ASTM skid trailers. The experience here is that seasonal locked-wheel friction variation, which is between 10 and 20 % depending on the location, will occur.

The aggregate was, however, not identical to that chosen in this Technical Report as it was taken from another source. Still the USA experience indicates that problems may arise at test sites with extreme climatic conditions.

0.2 Reasons for publication of a Technical Report

Establishing the proposed surface as a standard surface was deemed to be premature due to lack of experience with it by several ISO/TC 22/SC 9 member bodies. On the other hand, the majority of ISO/TC 22/SC 9 and the voting members of ISO/TC 22 found that the available experience with the surface and the basic principles for its construction were well-founded enough to give the proposal the status of a Technical Report. This means that ISO/TC 22 recommends its members to use this type of test surface so as to gain the necessary experience in judging its usefulness in vehicle handling tests and to study its durability under local conditions.

The reasons behind the deterioration of the USA test surface should be analysed in order to find out whether similar problems are to be expected with the surface described in this Technical Report and consequently how to avoid them.

The possibility of making prefabricated surfaces on steel plates should be considered, as it could reduce the problem of finding the correct epoxy mixture.

1 Scope and field of application

This Technical Report describes the construction of a surface suitable for vehicle testing that will possess a high level of friction under wet and dry conditions and a reasonable level of durability. Such a surface will have a friction level corresponding to that usually found on the best modern existing roads.

2 Reference

ISO/R 527, *Plastics — Determination of tensile properties.*

3 Sand requirements

3.1 So that the variation in friction level of the surface resulting from climate, usage and aggregate type can be kept to a minimum, the sand supply source specified in this Report should be adhered to strictly.

3.2 The quartz sand selected is partially rounded, which not only reduces the changes in friction values of the surface with usage but also reduces the degree of tyre wear.

3.3 The test surface does not in any way relate to the properties of any road surface in general use, but rather serves to represent the frictional conditions.

4 Existing surface

The contractor is required to inspect the site and satisfy himself that the existing surface is satisfactory for the proposed treatment.

The surface upon which the surface dressing is to be laid should possess adequate structural stiffness for the loads and shear forces expected from the test vehicles.

The existing surface should have a mean texture depth not exceeding 0,7 mm (sandpatch method) and have sufficient transverse slope.

5 Binder

The binder shall be a chemically curing bitumen-expanded two-component epoxy compound: the two components shall be heated and metered in proper proportions and homogenized immediately prior to application to the pavement. The material shall have good adhesion to clean asphalt or concrete surfaces.

6 Aggregate

6.1 Source

Natural uncrushed silica sand of one granular size shall be used, extracted from Leighton Buzzard deposits and washed, dried, and free from surface-active materials.

6.2 Grading

The sand shall pass through a test sieve with nominal aperture size 1,2 mm and be retained on a test sieve with nominal aperture size 0,6 mm.

The commercial grading tolerance shall be within the limits of ± 10 % on each sieve.

6.3 Moisture content

The moisture content of the sand shall not exceed 0,1 % dry mass.

The sand shall be supplied dry, in water-proof bags and shall not contain excessive amounts of impurities.

The material shall be stored and handled so as to prevent size segregation and contamination by foreign substances.

7 Surface preparation

The surface of the site should be vigorously brushed to remove dust and any loose detritus. Any oil residue on the road surface shall be removed by working and scrubbing with a weak detergent solution followed by flushing with clean water or by other approved methods. Existing road-markings, etc. shall be masked.

8 Spray application of binder

The resin binder shall be sprayed onto the road surface by a self-propelled mechanical applicator machine. This sprayer shall be capable of accurately and continuously batching the two components of the resin, thoroughly mixing them together and spraying the product onto the surface. If necessary, the two components of the resin shall be heated to facilitate spraying. The control mechanism shall maintain proportion by volume of each component within 2 % of the intended proportion, expressed as a percentage of the total volume, and a flow-rate meter calibrated to this degree of accuracy shall be provided for each component.

The sprayer shall be capable of spraying the mixed material onto the road surface with an accuracy such that the amount of binder collected on any stretch of the surface 50 mm wide within the width of the spray-bar shall not differ from the average amount over the whole width of the spray-bar by more than 10 %. In addition, the mean of the amount of binder collected on any four adjacent strips shall not differ from the average by more than 5 %.

The mixed resin shall be sprayed onto the surface at a rate of not less than 1,35 kg per square metre. The resin shall be allowed to cool to road surface temperature; it shall then be covered with an excess of the aggregate (Leighton Buzzard sand). No rolling of the aggregate is permitted. The amount of aggregate retained will be approximately 5 kg per square metre.