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Scope

For the design the construction of highway and airfield, it is imperative to carry out tests on construction materials for their scientific designing and even this utilization. The inherent strength of construction depends upon the maximum use of local materials. The prime objective of the different tests is to know and classify the various material into different groups depending upon their physical and strength or stability characteristics.

Different types of pavements are constructed on roads for the safe and comfortable movements of various types of vehicles at the desired speed. All these pavements are laid over a prepared soil surface called subgrade. Therefore it is necessary first to test the properties of the subgrade soil and to indicate its supporting capacity under the various moisture conditions, before taking up the design and construction of the pavements. The tests are needed on the subgrade soil for this purpose are for the classification and characterization of the soil, its density and compaction characteristics. It is also necessary to determine the strength characteristics of the subgrade for the design of pavements. Some of the important tests on subgrade soil are given in Part I of this book.

Pavements are classified into two major groups as flexible and rigid. The pavement sections which do not fall in any one of these types, are being classified as semi-rigid or semi-flexible. Depending upon the technique and the material of construction, the pavements are classified as (i) Water Bound Macadam (ii) Bituminous (iii) Concrete Concrete and (iv) Soil Stabilized. In most of the construction techniques, some aggregates are commonly used. The suitability of road stones are judged by studying their resistance against impact, abrasion, crushing and weathering action. The other properties of aggregates which are important are their shape, fineness, specific gravity, water absorption, relative efficiency with bitumen, etc. The important tests on aggregates for use as pavement material have been presented in Part II of this book.

In preparing bituminous mix, the aggregates are bound together in a pavement component layer with binding agents like bitumen or asphalt. Bituminous materials like emulsion, cutback, bitumen and tar (and Portland cement). These the tests on these binders are also carried out. The use of bituminous pavements for streets, highways and airports has increased quite rapidly during the last few decades. With the development of pavement industry in India, much thought should be available for utilization. Physical tests like penetration, viscosity, softening point, bulk specific gravity, etc. are in use in classifying and testing of bituminous materials. Viscosity test is also included in recent years for defining the materials for their scientific use. Part III of this book deals with tests on bituminous materials.

Bituminous mixes are used in the surface course of pavements, some types of bituminous mixes are also used in the base course of some flexible pavements. These paving mixes are to be designed to withstand the varying conditions of climate and traffic. There are several methods of bituminous mix design. Two of the most common methods are given in Part IV of this book.

Tests on cement and cement concrete mixes are not included as these are extensively dealt within recent technology through many standard publications.

Most of the tests on soil, aggregates, bituminous materials and mixes are standardized in different countries by different agencies/institutions. The test methods, details and specifications given in this book are based on those given by the Indian Standards Institution (ISI) and the Indian Roads Congress (IRC) wherever in the case of tests not covered by the ISI or IRC, the specifications and recommendations of other standard organizations like the British Standards Institution, American Society for Testing Materials, Asphalt Institute, etc. have been followed.

Preface to the first edition

Different educational institutions in India have now developed their syllabus wherein testing of highway materials have been included. Almost an urgent need of suitable laboratory manual has been felt. This book though particularly designed for engineering students, their with the relative tests that the field engineers engaged in paving jobs may also need to know it.

In preparing this manual, writers have extensively used the publications of ISI, IRC, AITRA, and Asphalt Institute. The help received from these publications is therefore gratefully acknowledged here.

Roodee (S.P.)
 January 1, 1960

Preface to the third edition

In this edition, the book has been revised in general and numerous revisions have been made by including new experiments like North Dakota Cone Test for subgrade soils, tests for J. and F. and tests for stripping value of Road Aggregates. Latest recommendations of the Indian Roads Congress have been included. It is hoped that this revised third edition will prove more useful to the students, teachers and the practicing engineers. The assistance rendered by Dr. S. Venkatesh is gratefully acknowledged.

Roodee (S.P.)
 April 25, 1977

Preface to the fourth edition

A new experiment, Field Density Test has been added in this edition under Part I of the book. More revisions have been made in several other tests, their discussion and applications.

November 14, 1980

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Sustainable Development Through Engineering Innovations Harvinder Singh, Puneet Pal Singh Cheema, Prashant Garg, 2021-03-01 This book comprises select peer reviewed papers presented at the International Conference on Sustainable Development through Engineering Innovations SDEI 2020 It presents recent advances new directions and opportunities for sustainable and resilient approaches to design and protect the built environment through engineering innovations interventions The topics covered are highly diverse and include all civil engineering and construction related aspects such as construction and environmental Issues durability and survivability under extreme conditions design of new materials for sustainability eco efficient and ultra high performance cementitious materials embedded structural and foundation systems and environmental geomechanics The book will be of potential interest to the researchers and students in the fields of civil engineering architecture and sustainable development

Transportation Engineering (Theory & Practice) Raji A K, K K Babu, 2025-06-01

Industry 5.0 and Paradigm Shift—Emerging Challenges Namit Gupta, Roopa Shinde, Rakesh Kumar Malviya, Anjali Gupta, 2023-01-23 Industry 5 0 is the successor of the Industry 4 0 concept which employed high technology in the manufacturing industry Industry 5 0 is a new idea that adds a human touch to the work of robots and smart machines The basic idea of humans and machines working together is to increase efficiency and effectivity like the Internet of things IoT It aims to merge the increasing cognitive computing abilities of the robots with the intelligence and resourcefulness of the humans The progress of Industry 5 0 is inevitable As the technology grows more each day we find ways to make our work simpler The development of such technologies to make the world more efficient requires its manufacturers i e humans who collaborate with these machines and technologies Humans are indispensable resources as what a machine can do is limited And with all these efficiencies we have come so far there is no path leading us back With adoption of new concepts comes a paradigm shift as development continues and we move from Industry 4 0 which speaks of the future of production its primary purpose continues to be achieving seamless connectivity between machines and IT systems for higher productivity and efficiencies across the value chain Overall it focuses mainly on traditional financial and operational KPIs Whereas Industry 5 0 gives a human touch to the concept of 4 0 keeping in mind the well being of the environment and society making the machines and humans work together on a path of Green Future Industry 5 0 has the balance of both humans and technologies which benefits the ecosystem with discovery of new energy sources and renewable resources helping in a sustainable working environment It can be used to reduce harmful residue caused due to manufacturing processes and recycle rare materials Taking this theme the multidisciplinary congress on Industry 5 0 and Paradigm Shift Emerging Challenges will highlight research challenges and open issues that should be further developed to realize Industry 5 0

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