Asphalt Pavements

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The Sheet Asphalt Pavement is not a modern invention. This material was used for street covering purposes by the Ancients, and sections of it have been dug up with the other evidences of past civilizations. Having in mind the centuries that have elapsed since its first emlpoyment as a street pavement, the surprising thing is that so little progress has been made in its development, and practically none until recent years.

The European Asphalt Pavement is the rock asphalt, it being prepared from native bitumen-impregnated rocks. The natural substance is ground to a powder, heated, spread and then compacted by tamping or very slow rolling. To secure the best results, two or more rock powders from different sources and having different characteristics are combined to produce a better grading of mineral aggregate and a most satisfactory bitumen content. Many very good asphalt pavements have been laid with this material in Europe, and some on this side of the Atlantic.

The American Asphalt Pavement was first produced by E. J. De Smedt, about 1870, and may be considered as an attempt on his part to imitate, at a less cost in this country, the rock asphalt pavements of Europe. The Europeans still term rock asphalt pavements as natural and the American product as an artificial asphalt pavement. As has happened in many other cases, the substitute leaves nothing to be desired of the original.

The Modern Asphalt Pavement consists of a mineral aggregate of specially graded sand and impalpable dust, thoroughly mixed, and bound together with asphalt cement. Roughly speaking, the mineral aggregate is ninety per cent by weight or seventy-five per cent by volume, the specific gravity of the bitumen in the asphalt paving cement being but slightly more than that of water. The grit mixtures and the stone-filled sheet asphalts are the same with a small proportion of fine stone chips added, not usually over thirty per cent.

The Asphalt Paving Cement is, of course, a vital matter, since we could not have an asphalt pavement without it. More pavements fail to-day, however, because of the lack of an understanding of the necessary requirements for the mineral aggregate, or carelessness or ignorance in the making of the paving mixture. Our public officials frequently go to great lengths to make sure that the materials furnished are what they should be, and then permit those materials to be spoiled at the asphalt mixing plant.

Many Good Asphalt Cements are on the market. They are manufactured from crudes found in Mexico, California, Trinidad, Bermudez in Venezuela, and elsewhere. All are of so nearly equal value that only the uninformed or specially interested will to-day pay a great difference per square yard for asphalt pavement in which one or the other has been properly used. The per square yard competitive basis, under carefully drawn specifications and competent inspection, is now universally recognized in wholesome communities.

Asphalt Cements Need Testing no matter from what crude materials they are made nor by whom. Some public officials do not seem to think so; but could they know how well they are spotted by the supply houses, and how carefully this frame of mind is cultivated for them, they would very soon change these views. Doubtful material, or material that has been condemned by some careful official who does have his deliveries tested, is always shipped to the other man.

The Consistency of Penetration of the asphalt paving cement is the first point to which we look. In a material that is pure, and with a mineral aggregate that is properly graded, it is customary to use the following classes of material for the different conditions of traffic in this climate:—

Heavy Traffic . . . . . 45 to 55 penetration,
Medium Traffic . . . . . 55 to 65 penetration,
Light Traffic . . . . . 65 to 75 penetration,

Unless otherwise specified, all penetration tests are made with a number two standard needles acting for five seconds under a load of one hundred grams at seventy-seven degrees Fahrenheit.

The Ductility and Other Tests are of great importance in determining the quality of the asphalt cement, but they are more particularly the concern of the asphalt chemist, and must receive close attention at the laboratory. The field engineer should be in close touch with the chemist and know the general characteristics of the asphalt cement he is using.

The Inorganic Dust or Filler is a factor of prime importance. The material most commonly used is limestone dust pulverized in a grinding mill to such fineness that at least seventy-five per cent will pass a standard two-hundred mesh testing sieve. When the material is less fine, more must be used to secure a given result; and, as the inorganic dust is usually introduced cold, at the mixer, into the hot sand that forms the bulk of the mineral aggregate, the result of using too much of this cold material is obvious. Such mixtures, in that they approach the aggregate of rock asphalt pavements, are also harder to lay in the manner usually employed for the construction of the artificial or American pavement.

Stone Dust and Portland Cement are the most widely used filler materials, the former being the more common because the lower in cost, but the latter being preferred by some on the ground that it is thought to make a superior mixture. When portland cement is employed, the difference in specific gravity between that material and the remainder of the mineral aggregate should be taken into consideration. The mixtures are usually figured by weight instead of by volume, though the latter would seem a more logical method if it could be used with reasonable convenience.

Other Filler Materials are pulverized clay, marl, shale, silica, and so forth. Many substances have been tried and found satisfactory, but a few have produced disastrous results. Safety-first demands that a new material be thoroughly investigated before it is used extensively as an asphalt pavement filler. These investigations can only be conducted in a properly equipped laboratory, and by those with comparative experience to draw upon.

The Two-Hundred Mesh Sieve is not a sufficient test for an inorganic dust filler, except for routine work on a known material. The particles of dust that are of the most value are those that would pass a five-hundred mesh sieve, were one of such fineness of practical value for laboratory testing.

The Air Separation Dust Test is, by far the most satisfactory that we have yet found for making comparisons of fillers. Water separation gave some good results, but the air method seems more practical. Neither is sufficiently simple to be used on routine work, so the two-hundred mesh sieve must still be relied upon for much of the checking of deliveries with samples submitted. As we do not know of any other air or water separators of the types we are using in Canada, they being constructed by us, it is hardly worth while at this time to base test requirements upon them.

The Specially Graded Sand that forms about seventy-five per cent of the weight of a standard sheet asphalt pavement surface is a very simple matter, if one fully understands and appreciates what is necessary. To fully comprehend the very great difference in an asphalt pavement mixture that the grading of the sand will make, one has but to follow daily on the street the work turned out by a mixing plant where the man in charge is careless of detail, or thinks that any old sand grading is good enough.

To any of our readers who may be interested in Mr. Mullen's excellent paper, we will be pleased to mail a complete copy.

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