Analysis of the condition of roads in our country shows that, almost everywhere, the service life of newly constructed or completely repaired asphalt pavement does not meet expectations. Failures of individual sections and significant erosion and cracking begin with the first year of service, whereas in other countries, pavement life amounts to 18 years. The serviceability of asphalt concrete pavement depends on the accuracy with which rules and standards are observed in all stages of the roadbuilding process: selection, storage, and preparation of the asphalt and mineral materials; selection and mixing of the components of the asphalt concrete mix, laying of the asphalt concrete pavement, and so on.

Because of the many factors influencing the strength of composite materials, we cannot blame the short life of pavement solely on some disruption of process conditions in the preparation and laying of the asphalt concrete mix, unjustified extension of the time intervals for performing construction and repair operations, or the lack of modern roadbuilding equipment.

Experience of the Trust Lendorstroi-2 in using the Remixer 4500 asphalt-laying system manufactured by Vertgen, an asphalt spreader manufactured by Fegel, and vibratory rollers has demonstrated the feasibility of laying asphalt concrete mixes at a higher level of quality, i.e., smoother and with a higher compaction factor for the coating. However, the use of this equipment does not eliminate certain basic and nearly universal defects such as stripping of the asphalt film from the surface of the mineral filler and cracking of the film, ultimately resulting in breakdown of the pavement.

The paving asphalts produced in our country typically have rather poor adhesion to the acid-type mineral materials used in preparing asphalt concrete mixes [1, 2], so that the asphalt binder film is undercut by water, and mineral grains are exposed and scattered in the course of service of the asphalt concrete. The need for additives to improve the adhesion in asphalt concrete has been demonstrated [3].

However, such additives are not used widely, as no clear-cut recommendations have been made regarding the selection of additive type and the method of incorporating the additive; other factors holding back the use of these additives are the shortage and toxicity of surfactants of the amine type that have gone through commercial testing and approval. In view of the great diversity of the chemical nature of mineral materials on the territory of Russia, particularly in the northwestern region, the problem of developing asphalt concretes with strong adhesion properties can be solved by proper selection of mineral materials having the highest strength of adhesion to asphalt, for example gabbro-diabases.

The serviceability of an asphalt binder in asphalt concrete that is subjected to periodic shear and compressive loads, and also to temperature differentials, is greatly dependent on the plasticity and ductility of the asphalt. Hence it is has become advisable to assign grades to paving asphalts in our country and abroad on the basis of penetration (depth of needle penetration), along with a minimum ductility at 25°C (Table 1).

However, the standards of the United States, Sweden, Finland, and other countries, in comparison with GOST 22245–90, impose more stringent requirements on the ductility of paving asphalts. The level of ductility required in these other countries is maintained only in the Russian specification TU 381011356–91 for "asphalt, paving, improved, BDU grade," which is produced from heavy Yarega crude.

In the storage of petroleum asphalts and the preparation of mixes with mineral materials, the asphalts change in structure, since they are colloidal systems that are thermodynamically unstable. As a result, the asphalt viscosity increases during storage, while the plasticity and ductility decrease [4].
A comparative analysis of the standard requirements for paving asphalts in our country and other countries has pointed out a basic difference in the criteria of thermal stability and in the methods used to evaluate thermal stability. The standards of the United States, Sweden, Finland, and other countries take into account the changes of penetration and ductility of asphalts that take place during storage at elevated temperatures and upon mixing with mineral material; minimum allowable values are established for these indexes when evaluated after testing for thermal stability by the ASTM D 1754-83 method. It should be noted that the level of ductility after exposure to heat that is specified in the foreign standards corresponds to the level of ductility required for domestic asphalts before the test for thermal stability.

GOST 22245-90 does not require determination of the changes in plasticity or ductility of asphalts due to thermal aging; the thermal stability is predicted from the change in softening point of the asphalt in a test performed under mild conditions, which simulates only brief storage of the asphalt at an elevated temperature (GOST 18180-72 method). In view of the difference between the Russian and foreign criteria that are observed in qualification testing of paving asphalts, as well as the incomparably shorter service life of asphalt concrete in our country, it has become necessary to obtain objective information on the quality of domestic paving asphalts, and on the influence of asphalt ductility and plasticity on the service life of the binder in an asphalt concrete pavement.

The materials selected for these studies were commercial asphalts BND 60/90 and BND 90/130 (GOST 22245-90), produced by oxidizing a vacuum resid from mixed West Siberian crudes in an asphalt unit of the Kirishinefteorgsintez Association, and also the "improved" asphalt BDU (TU 381011356-91), produced by oxidizing vacuum resid from Yarega crude in an asphalt unit at the Ukhta Petroleum Refinery.