TNZ P/5P NOTES: 1985

NOTES FOR USE OF NATURAL RUBBER LATEX IN RESEAL BINDERS

These notes are for the guidance of supervising officers and must not be included in Contract Documents.

1. SCOPE

Natural rubber latex may be added to asphaltic binder for resealing works as described in TNZ P/4.

The natural rubber has the effect of raising the softening point, and increasing the viscosity and elasticity or elastic recovery of the binder.

From experience principally in Dunedin district, the use of natural rubber latex has been found to produce an increase in initial toughness, to help to prevent early chip loss or chip roll-over and in the longer term to resist the development of reflective cracking. Its use is generally aimed to extend the waterproof character of a reseal over an existing seal coat with widespread cracking.

2. PLANT

The blending tank is required to have a capacity at least 50% greater than the total hot volume of material being blended to allow for the foaming which occurs as the water in the latex evaporates. Blending on site in a distributor tank is satisfactory providing the batch is limited as specified to allow for foaming.

Pump circulation, providing the pump is operated at about 80% of maximum speed, is considered to be equivalent to the use of paddles for mixing purposes.

3. ASPHALT CEMENT

The use of only 180/200 penetration grade of asphalt cement is specified. Although natural rubber latex can be mixed with 80/100 grade, in order to obtain the cracking resistance (additional elasticity) to the greatest degree, 180/200 penetration grade should always be used, and where 180/200 grade would normally be used, about 2 pph of AGO should be added.

4. NATURAL RUBBER LATEX

There are two forms of natural rubber latex available, centrifuged latex which is about 60% rubber solids with 40% water, and evaporated latex with about 72% rubber solids and 28% water.

The degree of dispersion of rubber in bitumen depends to a large extent on the chemical nature of the bitumen. Effectively whilst rubber dissolves completely in highly aromatic bitumen, it does not dissolve in non-aromatic bitumen. Bitumen with medium aromaticity produces the best mix as the rubber is dispersed in the form of ultra-fine microscopic particles and filaments which can form a network throughout the binder.

Asphalt cement produced at the Marsden Point refinery has only slightly less than the optimum aromaticity therefore is very suitable for blending with natural rubber latex. Not more than one part of rubber solids per 100 parts of asphalt cement can be incorporated in an asphaltic binder without rendering the binder impossible to spray uniformly.

5. BLENDING

From experience it has been found that the best dispersal of rubber is obtained when the asphalt cement has been heated to a temperature of 165^{o}C.

To reduce foaming, some contractors prefer to add an anti-foaming agent to the asphalt cement before adding the natural rubber latex.

The latex should be sprayed onto but not poured into the heated asphalt cement surface. Initially it should be added gradually, until the intensity of foaming can be gauged and the optimum additive rate established. Use of evaporated latex will reduce the foaming because of its lower water content. The water in the latex should flash off and the residual latex should float on the surface for about 20 seconds before being drawn under. It is essential that the residual latex should not float on the surface for any longer period, or be allowed to build up on the surface, otherwise coagulated rubber which can cause filter and spray nozzle blockages will result.

Mixing should continue vigorously for at least 20 minutes after the natural rubber latex has been added.

6. OTHER BINDER COMPONENTS

The mixed binder may require to be heated before the adhesion agent, AGO and kerosene are added to avoid heating the cutback binder.

The relatively high total diluent content specified of not less than 10 parts per 100 parts of asphalt cement is essential to obtain a suitable viscosity for spraying at the higher spraying temperature specified. Because of the initial toughness quality of the rubberised binder, this additional diluent is not expected to cause any problems of chip adhesion.

Where the shade air temperature is below 15°C additional kerosene will be required, the extra pph being obtained by subtraction of the pph for 180/200 penetration asphalt cement in table II of TNZ P/4 at the relevant shade air temperature from that at 15°C.

The addition of a suitable adhesion agent conforming with TNZ M/13 is essential for rubberised binder. The rubber in the binder increases the risk of adhesion failure significantly unless a suitable adhesion agent is used.

7. STORAGE AND TRANSPORT

During storage and prior to spraying, the rubberised binder should be agitated to prevent separation. The maximum storage periods relative to binder temperature are those recommended by the Natural Rubber Producers Research Association.

8. SPRAYING TEMPERATURES

Spray temperatures are critical with rubberised binders. There appears to be a critical temperature at which the spray jets narrow and the spray distribution becomes very poor. The spray rate range of 10°C and 15°C above the temperatures fixed in table III of TNZ P/4 is closely related to the total diluent required in the rubberised binder to ensure satisfactory spraying. For some reason which is not fully understood, further increase in binder temperature cannot be used to reduce the total diluent.

9. PAYMENT

Conventional laboratory testing of the rubberised binder gives very ambiguous and unrelated results, therefore it is important that the blending is closely supervised so that payment can be made on the basis of actual quantities of AGO, kerosene and natural rubber latex incorporated in the binder. However, samples of each batch of blended binder should be taken prior to and after the completion of spraying a distributor load. These samples should be sent to Central Laboratories for evaluation.

10. OTHER COMMENTS

Asphaltic binders with natural rubber latex can be used under all conditions when asphaltic binders can be applied in accordance with TNZ P/4.

Dry grit locking coat may also be applied although from experience it is evident that the early additional toughness of the binder may reduce that need.