COMMON USE OF INTERLOCKING BLOCKS IN COLD DISTRICTS

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In recent years, the motorization in Japan, accompanied with an increase of traffic accidents, all kinds of pollution and other obstruction to the living environment, gained remarkably.
Especially wear down of pavements and asphalt dust, caused by spike tires, are serious social prob lems in cold districts.
To cope with this problem, we executed a test by constructing an experimental pavement using Inter locking Blocks.
The experimental pavement was located in the suburb of Sapporo City, in Hokkaido, Most of the cars over there are using spike tires during the winter season, and the traffic is about 5,000 cars a day. The street were paved with blocks where the asphalt pavement had been leveled down. The thickness of the pavement was 80 cm.
The points of research of this test pavement were as follows:
1) deflection rate 2) slip resistance 3) abrasion rate 4) transversal profile 5) vertical profile

The result of research were as follows:

1) The pavement was not deeply rutted and the life of block pavements lasts longer than that of asphalt pavements.
2) Abrasion rate is smaller and the dust pollution became less.
3) Slip resistance was larger, which helps to control the car.
4) Not a difference was noticed in point deflection rate and flatness of the pavement, just after the construction and after one year of common use.

1. INTRODUCTION

This report is the result of a trial pavement that was carried out by the Japan Association for Interlocking Block in December, 1984. The quantity of the interlocking block for 1987 produced in Japan was 3,000,000 m^2. The quantity for roadways is very small though the quantity demanded is increasing. Much experimental data concerning the durability and stability of many types of interlocking block pavement (hereinafter referred to as "block") are required for the varied diffused use of it. Win people faith in the product is also necessary.
Since Japan's Hokkaido region is located in a cold district, consideration for the reliability for road traffic during winter is required. Also the security of road traffic is a necessary and fundamental concern for daily life and economic activities. Rutting and abrasion of road surfaces are dangers in terms of safety, and are causing financial problems due to the necessary repairs and visual problems concerning the dust. On the other hand this block is a pavement materials with high performance (abrasion resistance, slip resistance etc.), and the future theme in Japan is its use for roadways.
This trial pavement has been investigated with these points by the Association for interlocking Block, since December, 1984. This report is a summary of the results of the trial pavement.

2. OUTLINE OF TRIAL

The trial paving was carried out on the principal city road between Makomanai and Shino cities with the cooperation of Sapporo City, in December, 1984. The width is 7.5 m (2 lanes) and the length was 200 m. Fig. 1 shows the measuring points for each trial. The traffic flow volume in this case is 300 large-sized

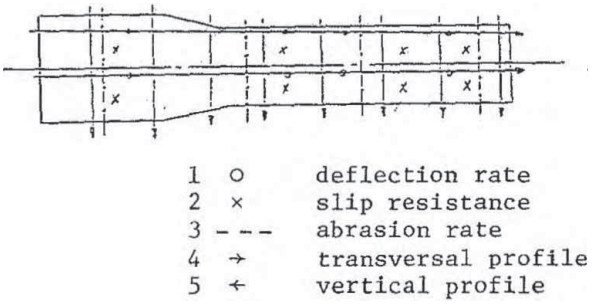


Fig. 1 Measuring points for each investigation

motor vehicles per day and 5,000 ordinary motor vehicles per day. And the traffic flow of motor vehicles with spiked tires was 800,000 units per day from the middle of November to the middle of April.
The cross-section of pavement structure is shown in Fig. 2 and the pavement surface depth was cut by 10 cm. The block was installed after a 2 cm deep sand cushion was spread. The installation pattern was herringbone bond as shown in Fig. 3. And the block unit used which had

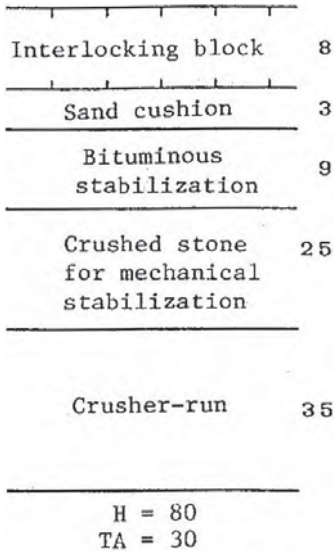


Fig. 2 Cross-section of pavement structure

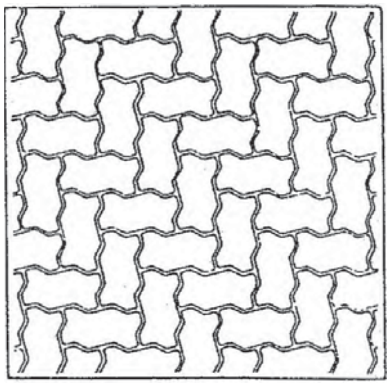


Fig. 3 Installation pattern

a thickness of 8 cm. Considering its abrasion resistance, the block was made of concrete with a 10 mm aggregate using the single layer molding method (Generally in Japan, double layer molded products with a colored layer are the main stock.). The materials used (aggregate, cement) and the mix proportion, were as any a standard block.

3. RESULT OF THE INVESTIGATION

3.1 Abrasion of the block

Abrasion of the block was studied along 4 measuring lines. And its thickness was measured at 8 points by slide calipers and the average value regarded as the abrasion rate. The measured results are shown in Fig. 4.
The average abrasion rate was 2.4 mm after one winter and was 7.2 mm after three winters.
The maximum abrasion rate was 8 mm after one winter and 24.5 mm after three winters.
Recording to the result of the investigation from 1977 to 1981 in Hokkaido with a daily traffic volume of 5,300, the abrasion rate of asphalt pavement was about 6 mm after one winter. Therefore this result of the investigation was sufficiently successful.

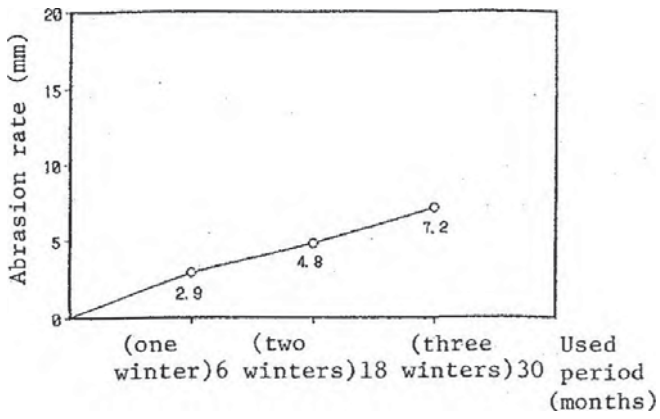


Fig. 4 Measuring results of abrasion rate

3.2 Road surface roughness

The profile of the road surface was measured on transverse and longitudinal measuring lines by a profile meter that is shown in Photo. 1. The road surface roughness is shown in Fig. 5 .and the rutting which is considered to be caused by spiked tires was present. On the other hand, the surface smoothness is shown in Fig* 6 and a large change was not seen.

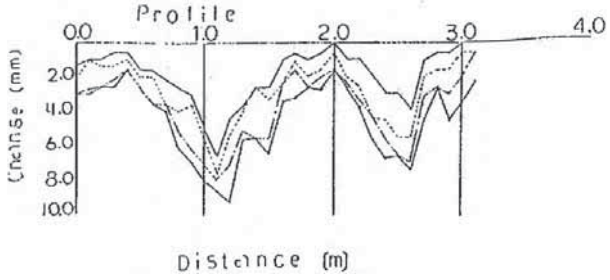
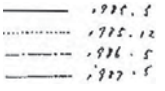


Fig. 5 Transverse profile



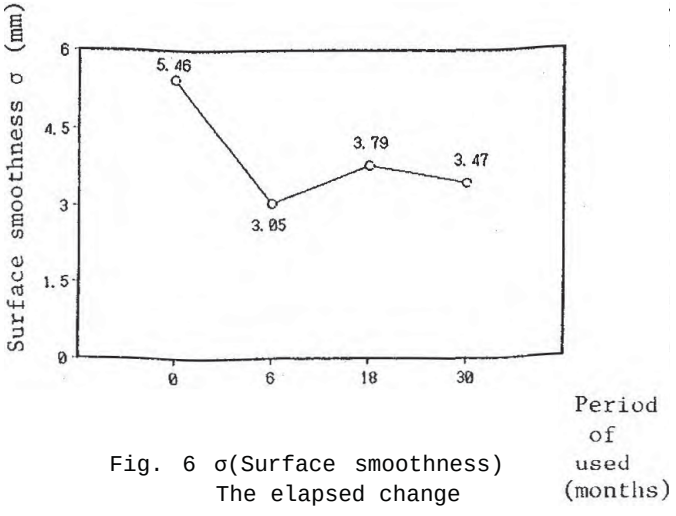


Fig. 6 σ(Surface smoothness) The elapsed change

3.3 Slip resistance

The slip resistance was measured at 8 points by a portable slip resistance tester. The results are shown in Fig. 7. The slip resistance in wet conditions during 30 months of service was 58 ~ 62 BPN. There is not no large change.

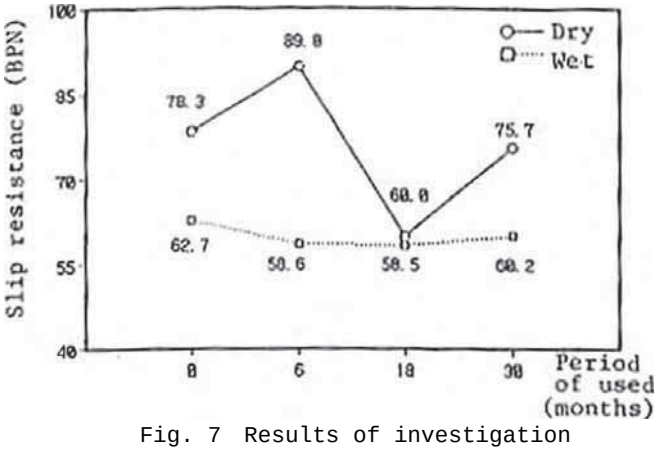


Fig. 7 Results of investigation of slip resistance

3.4 Deflection rate

The deflection testing was carried out by deflection measurement with the Benkelman beam. The results are shown in Fig. 8. The deflection during 30 months of service 0.21 mm + < 0.45 mm and each result is a small value.

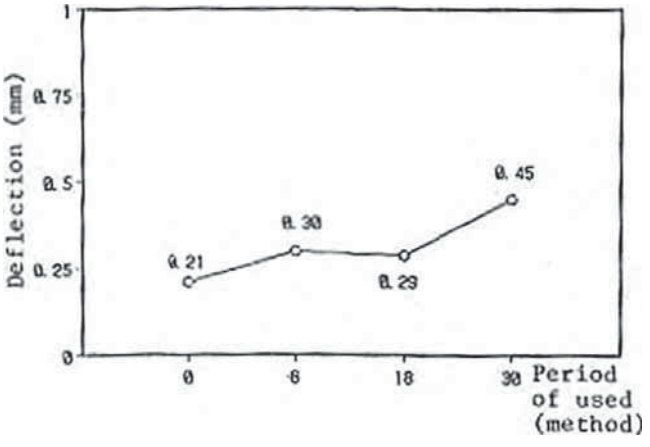


Fig. 8 The elapsed change of deflection

4. CONCLUSION

The results of the investigation for three years are as follows.

(1) The measurement results of the abrasion rate by block extraction was an average 2.4 mm per year. The abrasion resistance is sufficient in comparison with the asphalt pavement.

(2) Concerning the road surface roughness of the block pavement; although there is a small rutting on the transverse lines, there is less change on the Longitudinal lines.

(3) The slip resistance shows less change during 30 months of service.

(4) The deflection shows only a small change during 30 months of service.

Sufficient results usability for roadway were obtained by this pilot pavement. Furthermore, it will be necessary to collect more data at various locations.

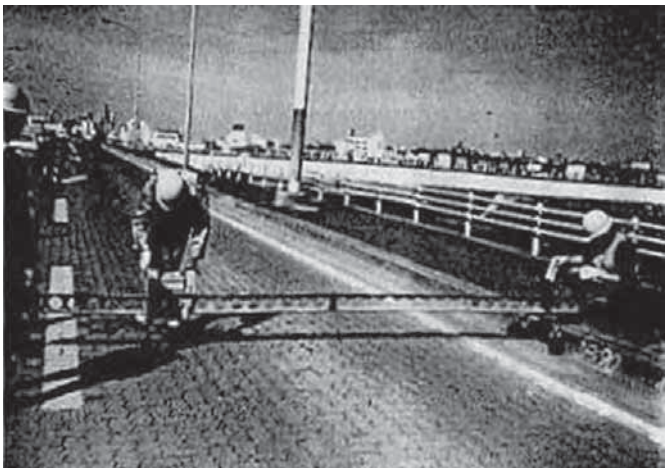


Photo. 1 Test pavement profile being measured