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THE THIN LAYER PAVEMENT ON THE BRIDGE DECKS

Revêtements minces sur tabliers de ponts

Dünnschichtbeläge auf Brücken

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It is now planned to construct huge bridges with a span of as long as 1,500m in Japan.
For these huge bridges, a thin layer pavement of 1 - 2cm is studied in order to lighten the dead load. However, as it is not yet decided which type of deck to adopt, among the steel deck, I-beam lok slab, and precast concrete slab, laboratory tests and trial pavements were performed to develop a thin layer pavement that could be applied to any of these types of decks.
This report is description of results of various trial pavements.

(1) TRIAL PAVEMENT AT KITAKOGANE ON NATIONAL HIGHWAY NO. 6

This trial pavement was performed to see the possibility of thin layer pavement. The pavement is located in one of the typical national highway in the suburbs of Tokyo, and the traffic volume of the test section is about 30,000 vehicles/day (all lanes), in which 30% of heavy vehicles are included. The width of the highway is 14m.
In the construction of trial pavement, the existing concrete slab were taken as the bridge decks, upon which 15 types of test mix-

No.	Kind of Binder or Mixture	Materials and Its Percentage (by wt.)						
		Binder	Coarse Emery	Fine Emery	Mineral Filler	Silica Sand No.3	Silica Sand No.6	Cement
1	Rubberized Asphalt No.1	7.0%	37.5%	46.5%	9.0%			
2	Rubberized Asphalt No.2	7.0	37.5	46.5	9.0			
3	Rubberized Asphalt No.3-1	7.0	37.5	46.5	9.0			
4	Rubberized Asphalt No.3-2	8.5			8.5	55.0%	28.0%	
5	Rubberized Asphalt Emulsion No.4	15.9	64.3	19.8				
6	Gussasphalt	9.0	25.0	36.0	36.0			
7	Cement-Clay Asphalt Emulsion	12.5		77.5				10%
8	Cement-Clay Asphalt Emulsion	12.5	59.5	26.0				10
9	Polyester Resin	18.9		81.1				
10	Tar Epoxy No.1	16.0	28.0	56.0				

Table-1 COMPOSITION OF MIXTURE (by wt.) continued

No.	Kind of Binder	Materials and Its Percentage (by wt.)						
		Binder	Coarse Emery	Fine Emery	Miniral Filler	Silica Sand No.3	Silica Sand No.6	Cement
11	Tar Epoxy No.2	16.0%	28.0%	56.0%				
12	Tar Epoxy No.3	16.0	28.0	56.0				
13	Colored Binder	12.4	29.2	43.8	7.3%		7.3%	
14	Cement-Rubber Latex No.1	41.5	58.5 (Granite)					
15	Cement-Rubber Latex No.2	36.4		63.6				

NOTE

Coarse Emery	2.5mm pass	35%
	1.2mm pass	1
Fine Emery	2.5mm pass	100
	1.2mm pass	50
Silica Sand No.3	1.2mm pass	73
	0.6mm pass	17
Silica Sand No.6	0.3mm pass	67
	0.15mm pass	30
Crushed Granite	2.5mm pass	60
	1.2mm pass	8

Table-1 COMPOSITION OF MIXTURE (by wt.)

tures were layed in 10mm thick, 3m wide, and 1m long for each mixture.
The composition of these 15 types of mixtures are shown in Table-1. Emery was used for aggregates with a few exception, and 4 types of rubberized asphalt, 1 type of straight asphalt (gussasphalt), 1 type of cement-clay asphalt emulsion, 1 type of polyester resin, 3 types of tar-epoxy, 1 type of colored binder, 1 type of cement-rubber latex were used for binder in which 2 types were applied by neat method and the rest were all mixtures.
The construction was performed in March 1964, and since then, the pavement were kept observing up to date.
The results of the observation are as follows:

i) Those showed least wear, in the survey 2 years after the construction, were tar-epoxy, polyester-resin, gussasphalt. Rubberized asphalt emulsion and colored binder which are performed by neat method showed little wear as well.
Those showed comparatively much wear were rubberized asphalt mixture, cement-rubber latex and cement-clay asphalt emulsion.

ii) Those showed high skid resistance coefficient in the measurement by the portable skid resistance tester were rubberized asphalt mixture with silica sand for aggregate and cement rubber latex. Other types showed approximately similar results.

iii) Those with less flexibility and caused scaling were 1 kind of tar-epoxy, 1 kind of cement rubber latex and polyester resin. Others are still in good condition serving under heavy traffic for 4 years.

iv) Judging from the above all results, it is remarkable in particular, that resinous materials had faults in inflexibility and rubberized asphalt mixture was economical and more durable.

(2) TRIAL PAVEMENT ON THE HANAWA OVERBRIDGE IN KEIYO TOLL ROAD

Rubberized asphalt mixture was placed in 1.5cm thick in average on the precast concrete slab upon the above said overbridge in

September 1964.
The composition of the mixture is shown in Table-2.

Materials	% by wt.
Asphalt Cement	6.5
Coarse Emery	37.7
Fine Emery	46.8
Mineral Filler	9.0

Table-2 Composition of Mixture

This overbridge which is located in Hanawa Interchange has traffic volume of about 10,000 vehicles/day (all lanes) including 30% of heavy vehicles.
No cracking and wearing has been found in the results of observation and the surface keeps good texture except only a little reflection crack at joint of slab.

(3) BUNKA BRIDGE IN OSAKA CITY

In March of 1957, upon the Bunka Bridge with steel deck, asphalt emulsion mixed with rubberized latex was sprayed, over which chipping of crushed stone (5 - 10mm) were uniformly spread. This bridge is located in the residential quarter and has about 600 vehicles/day (all lanes).
By the observation executed in 1963, the pavement was partially scaled off causing the deck exposed.
In April of 1965, replacing this pavement, tar epoxy mixture was placed in 10mm. By the observation executed in 1968, many cracks were found on the surface.

(4) MISOGI BRIDGE

This is a suspension bridge of which concrete slab was replaced to steel deck in 1965. The pavement was performed placing the tar epoxy mixture in about 5mm by hand. By the observation executed after 3 years, in 1968, the surface kept a very good con-

dition.
The traffic volume is about 600 vehicles/day (all lanes) with few heavy vehicles.

(5) NUMAKAWA SLUICE GATE BRIDGE

This is a steel deck bridge constructed in March of 1967. The pavement was performed by placing tar epoxy mixture in about 20mm by hand. At present after 1 year, the surface keeps a very good condition. The traffic volume on this bridge is 3,300 vehicles/day (all lanes) including 50% of heavy vehicles.

The above are the various types of trial pavement performed in Japan, but the definitive mixture for the huge bridges is not yet developed.
Therefore, Construction Ministry plans to execute another trial pavement for steel deck in a large scale on the road with a very heavy traffic in 1969. In this project, rubberized asphalt mixture and tar epoxy mixture, etc. will be adopted.

SUMMARY

This report describes several thin layer pavements trially constructed for surfacing steel bridge decks or cement concrete slabs. Various materials were used for these trial pavements and some of them are still kept in good condition after the lapse of several years under considerable volume of traffic. By the result of survey, it is observed that rubberized asphalt mixture and the tar epoxy mixture are most suitable for this purpose. However, for applying as the pavement on important bridges which support heavy traffic, further study is necessary.

RESUME

Ce rapport décrit plusieurs revêtements minces réalisés pour des essais sur tabliers de ponts en acier ou en béton. Des matériaux divers ont été employés pour ces tests, et plusieurs d'entre eux sont toujours en bonne condition après plusieurs années de trafic lourd. On est arrivé à la conclusion qu'un mélange d'asphalte caoutchouté ainsi qu'un mélange goudron-époxy sont les plus indiqués. Cependant, les revêtements destinés à des ponts importants à trafic lourd, exigent des études plus poussées.

ZUSAMMENFASSUNG

Dieser Beitrag beschreibt mehrere Versuche an Dünnschichtbelägen für Stahl- oder Betonbrücken. Verschiedene Stoffe sind verwendet worden, von denen einige nach Verlauf vieler Jahre unter schwerem Verkehr ihren guten Zustand bewahren konnten. Nach den Versuchsergebnissen zu schließen, sind Gummi-Asphalt-Mischungen und Teer-Epoxyd-Mischungen am geeignetsten für diesen Zweck. Es zeigt sich, daß für wichtige Brücken mit schwerem Verkehr weitere Studien notwendig sind.

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