

Construction Technology of APP Modified Asphalt for Pavement

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Abstract. In order to guarantee the APP modified asphalt linoleum bonding properties of level structure between old cement road and surface coating, the construction key technologies has carried on. Some results were obtained. First, the old road surface should be cleaned up. Secondly, the APP linoleum width deviation should not surpass 1.5 cm, the attachment place or the combining site should join 8-10 cm. To sum up, APP modified asphalt linoleum can improve propertis of asphalt overlaying on old cement concrete pavement.

Introduction

As a kind of waterproof materials, APP modified asphalt felt is not only widely used to prevent water in the covering engineering of roof, wall, basement, but also in those of pool, dam, pavement of bridge, highway and airport. Meanwhile, APP modified asphalt felt has another better performances, such as tensile strength, extends, thermal stability, and aging resistant performance. Moreover, breaking elongation rate changes a little along with the service life. Therefore, in recent years, APP modified asphalt felt has been gradually used to prevent crack between asphalt overlay and pavement in airport and road engineering, and some engineering experiences were obtained[1-5]. The construction of the APP felt is the key factor to guarantee its pavement performance because of the particularity of application environment. Therefore, the key construction technologies will be carried on by the outdoor experiments.

Pasting of APP modified asphalt felt by hand

Pasting of APP modified asphalt felt. Through the Heat Fusion Method, the APP modified asphalt felt was affixed by the professional construction team. The workers must learn the regulations and technical annotation before construction.

Construction equipments. The main construction equipment is a special flamethrower (with oxygen and acetylene liquefaction pot) or flame burner. All equipments and their applications are shown in Table 1.

Table 1 Heat fusion construction equipments

Name	Application	Name	Application
flame burner	Baking and paste felt	barrel	container of interlayer agent
iron spatula	compacting seam	scissors	felt cutting
broom	cleaning garbage	powder fire extinguisher	fire fighting
rolling brush	brush interlayer agent		

Pasting principle. Only having net-shaped cracks on old pavement, APP felt is not needed to stuck. However, APP felt should be affixed on the old pavement with net-shaped cracks and the others. For the cracks of the old board, it should be treated separately. When the crack is less than 60cm, the APP linoleum, width of 1m should be used to paste cracks and seams. Other condition, the width can be 50cm.

Contraction technology. To check and clean old plate → brushing interlayer treatment agent → location → zero line → paste APP linoleum → heating the bottom of the linoleum → rolling and paving linoleum → roll press, exhaust and stave → head fixed and sealed → checking, cleaning and

trimming.

In order to guarantee construction quality, conditions paid attention are as follow. The old plate surface has no cracks of more than 0.3mm, surface voids, sugaring, protuberance shell. The surface must be dry, surface whitening. Determination methods: the linoleum of 1 m² is halved and paved on old pavement surface. Then, it is uncovered and checked after for 3-4 h. It meets the requirements if the watermark is not seen on the the old pavement where is covered by linoleum. The pasted location should be cleaned thoroughly after the crack treating.

The linoleum is aligned by the position, the plastic film PE faces down and special backplane oil is brushed on the paste position. The backplane oil is generally matching sold by linoleum factory and should be tested to identify and validate with the some condition. Adhesive bitumen primer is the solution made of the building asphalt and the volatile materials, which is a mating production with APP felt. After the preparatory work, the kindling flamethrowers is used to barbecue the junction of linoleum and old plate. The distance between nozzle and the junction is 15-30 cm, the angle between midline of nozzle and ground plane is 60°. The linoleum is rolling with barbecue, shown in Fig.1. Heated uniformly, the linoleum film asphalt should be melted slightly. Only have luster with thin layer of black melting, the felt can be rolled. The barbecue should not be too long to prevent burning out tire body.

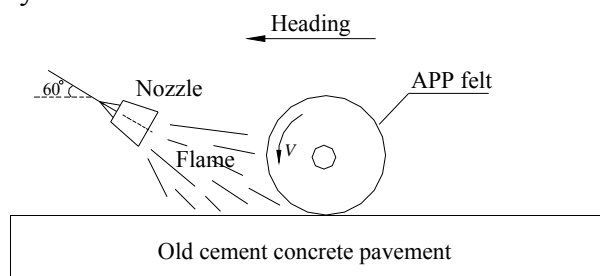


Fig.1 Schematic diagram of manual pasting

Before cooling, the upward surface of linoleum was kept compacted by feet immediately until some modified asphalt overflowed at the edge. Then, both sides of felt were sealed with spatula in order to paste on the cement pavement.

The attachment place or the combining site should join 8-10 cm. The intersections can not be cut off, which should be stuck to pavement or the other felt by heat fusion method in order to form the whole.

After sticking, the corners and edges of linoleum should be fixed with concrete nails to make it firmly bonded with the old pavement.

Corners of curb stone or waterspout should be cut into uniform and smooth circular-arc with a radius of 10 - 15 cm.

Evaluation of APP modified asphalt felt pasted by hand. Manual sticking technology and methods of APP modified asphalt felt is mainly from construction experiences of APP coiled material's roof waterproof engineering. However, special attentions should be paid if the material used for old concrete pavement overlaying asphalt[6].

Potential safety hazard. Tank of oxygen and acetylene liquefaction or liquefied oil will probably explode if lack management. Meanwhile, the flame construction is easily make a fire. The flame temperature is too higher to easily burn staffs.

Unstable quality. Flamethrower is used to heat linoleum. The heating effect is absolutely judged by manual observation, which is mostly depended on experiments, so the quality is not easy to guarantee. Moreover, felt body will probably burn out if the temperature can not be controlled in good condition. Both feet pressing on linoleum has a lot of personal trouble. Manual work rolling felt has a big different velocity. So the quality is not easy to dominate for too much personal factor.

Big environmental restraint. When it is windy, flamethrowers heating construction is restricted.

Low efficiency. The manual work efficiency is lower, with larger labour intensity.

In short, there are many problems in the current method. So far, there are not a set of special complete mechanical equipment for linoleum pasting. In order to increase work efficiency, to improve the degree of mechanization, to guarantee the quality of projects and ensure operating

workers' health, the development of the APP linoleum pasting machine is very necessary.

Quality control and test

Quality examining. Every 20 m is divided into a group along its length, as a quality estimation unit. The problems should be immediately recorded and treated with appropriate measures. Some random points were selected to measure peel strength. In selected locations, APP felts were cut into size of long×strip = 400 mm × 100 mm. The end of the strip was lifted up 30 mm, and then the detection equipment was installed to test peel strength, as shown in Fig. 2. The effects were measured at the peeling rate of 100mm/min and at the temperature of 30°C.

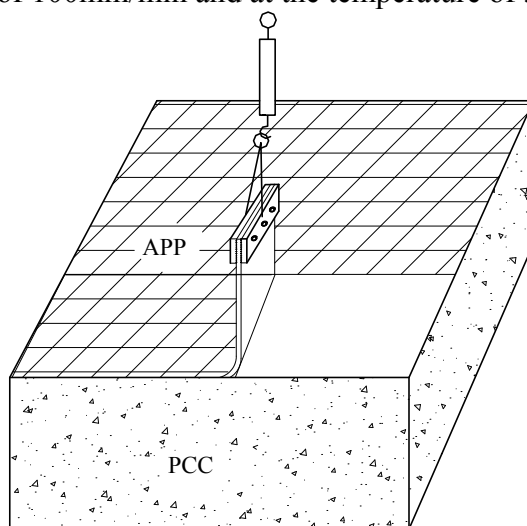


Fig.2 Schematic of peel test on site

The manual effects were measured at the peeling rate of 100mm/min and at the temperature of 30°C. The results were shown in Table 2.

Table 2 Peel strength measurement of APP felts manual pasted

Measuring points	1	2	3	4	5	6	Mean
Peel strength / (N/mm)	3.33	3.70	3.68	3.39	3.53	3.46	3.52

Table 2 shows that peel strength is about from 3.33 to 3.7 N/mm, with a higher mean 3.52 N/mm. The manual pasting method is worth to popularizing widely for its reliable quality.

Bond performance detection. The peel strength between linoleum and cement concrete is tested through spot-check on site, which represents heat fusion bond performance.

Surface Quality. Checking whether there are the phenomenon such as obvious damage, puncture, distortion and so on, whether the labels and the films have been cleaned or not on the linoleum surface. The flame heater should be used to evenly heat linoleum, not to concentrate heating or burn through linoleum.

Midline control. The pasted linoleum should be level and straight, untwisted and puckered. The geometric midline of linoleum should be strictly corresponded to the regular longitudinal or transverse crack middle line. The deviation is controlled in a certain range. Generally, as for APP modified asphalt felt of width of 50 cm, the width of each side on the crack is 25 cm. The geometric midline of linoleum along the length should not deviate the crack midline more than 1.5 cm. Hanging line method can be used to solve construction difficulty.

Overlap quality. Overlap should be precise. Longitudinal lap length should be controlled in the range of 8 - 10 cm. The overlap quality is tested by crack or not. Connector is repaired with screwdriver. Not sealed lapping should be repaired. The hidden trouble should not be leaved.

Quality control measures. The special materials are inflammable, so the storage and construction site must not be open flame, with fire equipments. The workers on site are required to wear uniform, gloves and other necessary safety protective appliances.

In order to avoid damage linoleum, the operator should not wear nail shoes but soft bottom ones

on construction site. The damaged hollow or hole parts should be timely repaired. After felt construction, product should be protected in order to lessen treading and grinding.

Conclusions

The old pavement needed to paste APP felt should be thoroughly cleared, without any dust, sand and pollutants. The workers on site are required to wear uniform, gloves and other necessary safety protective appliances. The damaged hollow or hole parts should be timely repaired. The deviation of APP linoleum width should not surpass 1.5 cm. And the attachment place or the combining site should join 8-10 cm.

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References

- [1] B.H. Shi, L.C. Cai , S. Wang:China Journal of Highway and Transport, Vol. 16 (2003), p.5-9.
- [2] X.W. He, S.P. Wu, H.Z Qiu: Journal of Wuhan University of Technology, Vol. 25 (2003), p20-22.
- [3] W.d. Liao, S.F. Chen, G. Liu: Journal of Wuhan University of Technology, Vol. 27 (2005), p30-33.
- [4] Q.L. Ma, G.L. Zheng: Journal of Highway and Transportation Research and Development, Vol. 22 (2005), p20-22.
- [5] C.H.Wang, X.C. Wang:China Journal of Highway and Transport, Vol. 21 (2008), p29-34.
- [6] B.H. Shi, H.B. Xie:Road Machinery & Construction Mechanization, Vol. 24 (2007), p1-5.