Recyclable Paving Fabric Protects Indiana Interstate

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Interstate 65 in Indiana required resurfacing due to progressively worse cracking from heavy traffic loading of asphalt concrete surface layers over a jointed concrete underlying pavement foundation layer. The project engineers originally considered a simple mill and fill operation to replace the deteriorated pavement with the same thickness of new asphalt concrete. The original replacement asphalt concrete layers were three inches of intermediate mix and two inches of surface mix. Recognizing that replacing the same section yields the same short-lived results, Indiana DOT explored options for enhancing the performance of the new pavement.

A closer analysis of the current pavement conditions indicated that moisture in the pavement section could be causing problems by pumping fines to erode the subgrade, and by generally weakening the base and subgrade through elevated moisture contents. A second problem they faced was the potential for reflective cracking where movement, associated with the jointing in the underlying concrete pavement, would typically reflect quickly to the surface of the new overlay.

The proposal to IN DOT included a geosynthetic interlayer to address both the moisture problem and to retard the development of reflective cracking. An AASHTO M 288 nonwoven needle-punched paving fabric has been proven to be an effective moisture barrier, as presented in the Transportation Research Board Electronic Circular EC006. A moisture barrier is created using a paving fabric system, installed with 0.25 gallon per square yard of asphalt cement tack coat over which the paving fabric is placed. When the surface course of asphalt concrete is placed on top, the heat and pressure reactivates the tack coat, drawing the tack coat up into the paving fabric to saturate it and to create a pavement moisture barrier. In an application subjected to high stress levels in the form of reflective cracking from underlying PCC pavement joints and high thermal stresses inducing thermal cracking, the selection of the needle-punched nonwoven paving fabric was also appropriate considering that the asphalt saturated paving fabric will stretch to span future cracking to maintain the integrity of the moisture barrier.

Although reflective cracking may return to the intermediate asphalt concrete layer, particularly because it was placed onto a milled surface of the old PCC pavement, the paving fabric will retard this cracking from developing in the surface two inches of new asphalt concrete. This is accomplished as the thick asphalt saturated paving fabric interlayer can absorb and attenuate crack inducing stresses from slight movement along the cracks in the underlying intermediate course. This stress attenuation is not accomplished simply through a typical pre-overlay tack coat and a direct placement of the surface course onto the intermediate course. Fiberglass interlayers that are only one third as thick and can absorb only half the necessary amount of asphalt cement tack coat were not considered, from a stress absorption and effective moisture barrier standpoint. A similar interstate project where GA DOT used a paving fabric to mitigate reflective cracking from underlying PCC joints was reviewed as an appropriate parallel project. On that project, the paving fabric and a two-inch surface overlay was as effective as a four-inch overlay without the paving fabric interlayer. This parallel project demonstrated the cost effectiveness of the proposed solution, since the installed paving fabric cost significantly less than one inch of asphalt concrete overlay while it performed equal to two inches.

The final design consideration of the project was that the relatively shallow placement of the geosynthetic interlayer may, in the future, place the interlayer within a pavement thickness which may need to be milled and replaced. Traditional paving fabrics have, over the last few years, proven to cause some problems in both the milling operation and in the asphalt plant reprocessing operations. This has, in some cases, rendered the millings containing traditional paving fabric unsuitable for recycling. The recyclable fiberglass-based products were not considered comparable in performance, for the reason discussed above and for installation survivability concerns. Fortunately, a newly developed needle-punched nonwoven polypropylene paving fabric had recently been developed which is specifically engineered to be easily millable and recyclable. Testing of the millability and reprocessing of this paving fabric into new asphalt concrete with enhanced performance properties will be shown.

Installation was accomplished smoothly ahead of nighttime paving. One concern was the timing of the two operations—fabric installation and paving. In some areas, the paving fabric was placed too far in advance of the paving operation and was subjected to excessive construction traffic before overlay placement. Due to the warm summer temperatures, this excessive traffic induced some tack coat bleed through. The fabric held up very well, but some local sanding over the fabric was necessary to protect the fabric from construction traffic dislodging or damaging the fabric.

A lesson learned for their next project is the paving fabric interlayer needs to be covered the same day, or as quickly as possible with the overlay, to minimize construction traffic issues. The project was finished to the satisfaction of Indiana DOT. This case history will cover the above reasons for the use of the geosynthetic and the planning and installation details.