

# Applying the ‘plywood principle’ for best results

Maximising carriageway strength and durability through best possible adhesion of asphalt layers lies behind Nynas Bitumen's thinking on bond coats.

It could be called the ‘plywood principle’ – obtaining the best performance from a multi layer structure by ensuring the layers are stuck together well. Everyone knows how, as a laminate, plywood gains its strength and while historically carriageways have not been thought of in the same way, there is growing belief that a strong bond between asphalt layers provides disproportionate benefits. The Highways Agency is now insisting on the use of an adhesive medium between all courses, to ensure more durable roads.

“This is one of the drivers of bond coat development and use in the UK,” says Nynas Bitumen’s Applications Manager for Performance Asphalt Jukka Laitinen. “There are other drivers of course, such as the need for non pick up (or non sticky) bond coats and higher standards generally, in both application and in performance.

“All in all, there is now an emphasis being placed on adhesive performance in carriageway construction that has not existed before.”

The term ‘adhesive media’ covers two generic types of emulsion based products,

of which bond coats is one. The other is tack coats, which are more conventional bonding materials traditionally applied by hand using a lance at ambient temperatures. Latterly, mechanical metered spraying has become the norm with hand spraying limited to restricted areas.

Bond coats are hitech and super effective, developed initially to ensure that thin

**“Nynas is determined to anticipate and meet its clients needs for inter layer bonding agents in the years ahead.”**

Dennis Day

surfacing remained firmly stuck to the binder course below them. Sold as proprietary products, in the main they are polymer modified and designed to exhibit measurable performance characteristics. Bond coats are generally applied through mechanical sprayers at temperatures up to 80°C to ensure homogeneity of application. Manual application at ambient temperature from drums is also performed where access is limited.

Metered bulk sprayers mean that the defined rate of application of a bond or tack coat can be monitored and recorded, enabling effective control of quality and ensuring that the inter layer bond is of high standard.

Bodies such as the Highways Agency and the Scottish Executive plus contractors have increasingly realised in recent times the

Sample testing is building data to ensure Nynas has a range of products to meet all bonding needs

importance of inter layer bonding, according to Laitinen. They have been influenced by studies, at Heriot Watt University for example, that demonstrate the true load bearing capacity of a road is lost if there is insufficient bond between layers.

Hence the growing conviction that a bond or tack coat is needed between all layers.

Says Laitinen: “It really does seem that the ultimate performance of even a very good asphalt mixture within a carriageway structure will not be as good if the bond is poor.”

Nynas with others is involved in substantial research into bond coats, extending beyond proving the viability of spray rates and performance. As a pan European company, Nynas’ interest in bond coat systems crosses the UK’s borders into markets as diverse as those of Scandinavia and Iberia. The intention is to ensure that the company has a range of products to meet all bonding needs on the continent as well as in the UK. Much data is currently being collected.

Nynas already produces two UK market leading products, Nybond and Nyclean/GripClean, the latter a non pick up bond coat used with considerable success at Heathrow, for instance (visit [www.modernasphalts.com](http://www.modernasphalts.com) for details). As mentioned above, the need for non pick ups has been a driver in the development generally of bond coats.

“Conventional tack coats and bond coats can be tacky as soon as they break and if there is any construction traffic about, the material can stick to tyres and get moved off site,” says Nynas Applications Manager for Cold Paving Technology & Surface



Nynas’ non pick up bond coats do not stick to tyres and remain inert until they receive asphalt

Treatments Dennis Day.

This means that, how ever carefully and evenly distributed the bond or tack coat has been, the film can potentially be broken and the bond made less effective.

“Non pick ups using Nyclean for example are non tacky when laid, they do exactly what their name says, they do not get picked up by traffic. They remain effectively inert until they receive asphalt, which melts them to produce the bond.”

Day confirms that bond and tack coats represent a growth market. “Nynas is determined to anticipate and meet its clients’ needs for inter layer bonding agents in the years ahead,” he says.

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Binder content upper layer	Binder content lower layer		
	≤ 4%	4.1-5.0%	≥ 5.1%
≥ 5.1%	0.15	0.15	0.15
4.1-5.0%	0.20	0.15	0.15
≤ 4%	0.25	0.20	0.15

Table1 - Recommended target rates of application of tack coat in kg/m<sup>2</sup> of residual bitumen for newly laid asphalt - New construction

Binder content upper layer	Binder content lower layer		
	Fretted/binder lean	Planed asphalts	Binder rich
≥ 5.1%	0.20	0.15	0.15
4.1-5.0%	0.25	0.20	0.15
≤ 4%	0.25	0.25	0.20

Table2 - Recommended target rates of application of tack coat in kg/m<sup>2</sup> of residual bitumen for existing surfaces - Maintenance

BS 594-2 © BS1

## BOND AND TACK COATS: RULES AND REGULATIONS

Clause 920 of the Specification for Highway Works specifies bond coats as well as tack coats for coated macadam, HRA, porous asphalt, microsurfacing and stone mastic asphalt binder and regulating course. It states that the choice of coat depends on the condition of the substrate, the stiffness and binder content of the layers and the type of site; and makes the

telling point that a tack or bond coat should generally be used beneath all bituminous layers.

Advice on the choice of bond coat or tack coat plus recommended target application rates are provided in BS594-2 (HRA) and BS4987-2 (coated macadams). “Bond coats generally have a higher binder content containing modifiers and are usually used at a

higher rate of spread....promoting improved adhesion with some waterproofing capability,” the Notes for Guidance states.

Guidance on bond coats used with thin surfacings comes under another clause. All proprietary thin surfacings must have a HAPAS roads and bridges certificate, says Clause 942, which requires the contractor to provide details of the bond coat used for the system.

