

Application of Tack Coat

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Introduction

A tack coat is an adhesive material applied between layers of the asphalt concrete that is laid down for road construction. The adhesive when applied correctly, helps to prevent the degradation of the road by keeping the asphalt concrete layers together. Fig. 1 shows the application of a tack coat over a pavement.

Tack coats are a necessity when it comes to the construction of roads today, but one question remains, how much tack coat is needed for proper bonding? The amount of tack coat applied is significant to the effectiveness of the tack coat as well as the quality of the road over time. Many different considerations go into the application of the tack coat, such as the method of application, the amount of tack coat used, and the cost of it.

With the importance of the tack coat, it is essential to know how to apply it. A tack coat has many ways it can be applied but has different effects. The main challenge is to find a very effective method that also keeps the cost down.



Figure 1. A tack coat applied to the first layer of pavement [1]

Objective

The objective of this research is to understand the many different variables that go into applying a tack coat, then determining the best way to apply a tack coat.

Methods

A sprayer typically applies the tack coat with a multitude of different nozzles and nozzle angles. Fig. 2 shows a truck with mounted nozzles spraying the tack coat onto the pavement. Most likely, the many different ways that the sprayers are configured and made directly affect the amount of tack coat put down and directly affect the durability of the road. When applying the tack coat, the trucks must go at a constant speed to get a uniform application of the tack coat on to the asphalt concrete pavement. If too little is applied, then the tack coat is not sufficient but add too much and it gets expensive.



Figure 2. A truck applying the tack coat onto the pavement [2]

Equipment

The equipment needed is a truck that carries and sprays the tack coat, such as the one seen in Fig. 3. Various other materials are required depending on which process is used to measure the amount of tack coat sprayed. These would include spray nozzles located at the back of some tack coat trucks to apply the tack coat directly from the truck. With this way of application, it is possible to determine the amount of tack coat applied by the flow-rate of the nozzles and the speed of the truck. Another way of application is by a hose spraying from a truck, as shown in Fig. 4.



Figure 3. A tack coat truck [3]



Figure 4. This is a man applying a tack coat with just a hose [4]

Tack Coat Application Rate Calibration

Method A: Weighing Pads

In this method, pads are used that have a predetermined weight; then, they are secured to the surface of the pavement, as seen in Fig. 5. Tack coat is applied and then reweigh the pads that now have tack coat applied to them. Once a weight difference is found that difference can then be used to calculate the application rate.



Figure 5. Weighing pads used to see how much tack coat has been applied [5]

Method B: Volume-based Calculations

In the volume-based method, the tack coat is sprayed into a container for a set amount of time. The volume of the collected tack coat is then calculated and then used to determine the application rate by using the calculations in Fig. 6.

Example Calculation of Tack Coat Rate

275 gallons of CRS-1 was applied 12 feet wide from Sta. 12+00 to 45+00 at a directed rate of 0.06 gals/yd². What is the actual tack coat rate of application in gallons per square yard?

$$\text{Rate of Application} = \frac{(\text{No. of Gallons Applied})}{(\text{No. of Square Yards Tacked})} = \frac{\text{Gallons}}{\text{Square Yards}}$$

For a Rectangular Area: $\text{Length} = \text{Ending Station} - \text{Beginning Station} = (45 + 00) - (12 + 00) = 3300 \text{ LF}$

$$\text{Rate of Application} = \left[\frac{(\text{No. of Gallons Applied})}{\left(\frac{\text{Length (ft.)} \times \text{Width (ft.)}}{9 \text{ ft}^2/\text{yd}^2} \right)} \right] = \left[\frac{275 \text{ gals.}}{\left(\frac{3300 \text{ ft.} \times 12 \text{ ft.}}{9 \text{ ft}^2/\text{yd}^2} \right)} \right] = 0.063 \text{ gals/yd}^2$$

Say: 0.06 gals/yd²

(Note: Significant Decimal for Prime Coat Rate is 0.01)

Figure 6. shows the calculations needed for the application rate of the tack coat [6]

The orientation of nozzles is also essential. Nozzles are oriented such that the tack coat does not overlap too much. A proper nozzle angle of 15-30% assures adequate overlap between nozzles without the interference of tack streams. Nozzles angles and overlap are illustrated in Fig. 7.

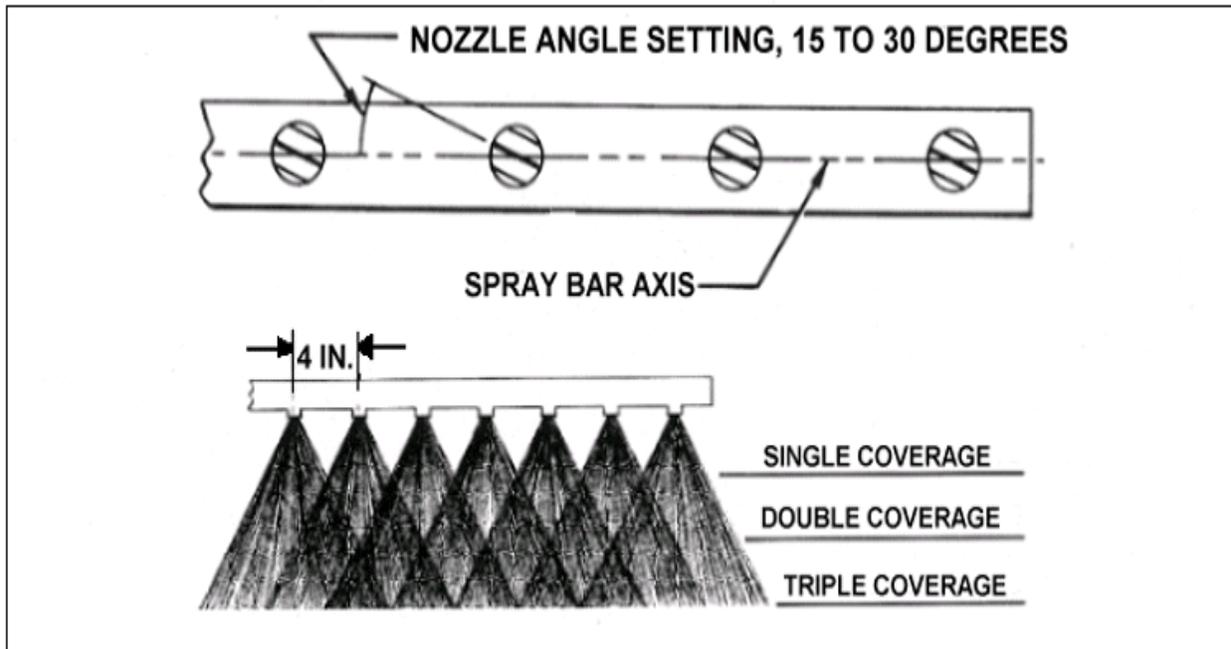


Figure 7. Nozzles positioned in various angles to cover a specific area with a determined amount of tack coat [7]

Optimum Application of Tack Coat

In general, a tight or dense surface requires less tack coat than a milled surface, and a flushed surface requires less tack coat than a dry or aged surface. The proper application rate also varies with the type of tack coat material used and the asphalt concrete that will be placed as an overlay. The application rate depends heavily on the smoothness of the material it is being applied. For example, if the asphalt had dimples in it, there would have to be more tack coat applied to fill in the dimples. For example, Fig. 8 shows an improperly applied tack coat as it is too little applied. Fig. 9 shows an example of too much tack coat applied as it is all being applied to a smooth surface. Then Fig. 10 shows an appropriately applied tack coat to a rough surface.

Before applying the tack coat, the tack coat must be heated to a temperature ranging from 120°-160°F. When considering the temperature at which to heat the tack coat before application, the surface that it is being applied to does not need to be taken into consideration.



Figure 8. A lightly applied tack coat [8]



Figure 9. A heavily applied tack coat [9]



Figure 10. An appropriately applied tack coat [10]

Summary

In conclusion, the tack coat is an essential aspect of the road-building process and is necessary to prolong the lifetime of the roadway. Along with its importance for the lifetime of the roadway, the way the tack coat is applied is significant as well. The tack coat has many different parameters that must be met to be applied most effectively such as the application rate of the tack coat, the surface the tack coat is being applied to, and the temperature of the tack coat and of the environment the tack coat is being applied. Once applied adequately then the tack coat will ensure a longer-lasting roadway that will far outlive a roadway without a tack coat.

References

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