

Characteristics of ABS Skid Marks on Snow-Covered Asphalt

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The use of a word such as "skid" in an article on anti-lock braking systems (ABS) would appear to be a misnomer since, by definition, anti-lock braking systems are supposed to prevent lock-up or skidding of a vehicle's tires. But we use this word purposely because there is actually some form of skidding or sliding of a tire when maximum braking of ABS is involved. It is just that the extent of the sliding between the tire and surface is not as great and it occurs in short bursts between periods where the visible tire mark appears to resemble the condition of a non-braked tire mark.

For investigators attempting to examine the characteristics of a tire mark in snow to determine if it involved braking the analysis is not all that straight forward as it is likely dependent the vehicle/system, the character of the snow on the road surface and the type of braking that occurred. We have prepared some brake tests to demonstrate some of the visible characteristics of ABS tire marks in snow.

The first test (see below) is on a asphalt surface covered by approximately 2 inches of fresh snow that has not been previously driven on by any traffic.



Figure 1: Maximum Braking Test on Two Inches of Fresh Snow



Above is a view of the braking mark resulting from the left side tires of the vehicle and on the following page is a view of the braking mark from the right side tires.



While the left side mark shows no signs of upheaval of the snow the right side does. The tread of the tire is visible and undisturbed on the left but some of the snow from the tread impression on the right is tumbled in the foreground while it remains relatively intact further toward the vehicle. The decision-making of modern braking systems is such that the character of braking marks on opposite sides of the vehicle may not be the same.

Near the point of final rest the ABS disengages and the tire enters into a locked state causing the character of the tire mark to change as shown below. Note the evidence of smooth sliding of the tire near its rest position versus the appearance in the foreground where the ABS was active.



In another test shown below , maximum braking was applied on an asphalt surface where the top layer of snow was plowed away leaving a thin layer of packed snow.



It is more difficult to detect these tire marks amongst the others but it is also more difficult to determine which of these tire marks indicate maximum braking. Close-up views of the tire marks from the braking vehicle are shown on the following pages. On the left side tire mark the details of the tire tread can be seen with little evidence of the momentary disruptions that are indicative of the short periods when the tire approaches lock-up before the braking force is reduced. In contrast the right side tire mark clearly exhibits those momentary pulsations.

The lack of loose snow in a snow packed environment means that characteristics of the tire mark will be more difficult to visualize. The looseness of the snow makes it scatter and become displaced when there are smaller differences in force therefore those differences are more easily visualized. Yet tire marks in any snow cover can provide a more visible imprint of the marks' characteristics than almost any tire mark produced on a dry asphalt surface.





As discussed in the previous test, the release of the ABS near the final rest position of the vehicle causes a well-defined, short sliding mark (see below) that is different in character from the mark visible in the foreground.



In a third test a vehicle was braked on a 1 to 2 inch layer of fresh snow that had fallen on the packed snow shown in the above photos. The resulting braking marks from this test are shown in the photo on the following page.



The tire marks on fresh snow provide some clear indications of the pulsations that occur during ABS engagement. These pulsations are visible in the photos shown on the following pages. Note also that during these pulsations the snow is thrown to the left and right of the left side tire mark while in those portions of the tire mark where the pulsation is not present there is no such dispersal of snow. Alternatively such throwing of the snow is not visible around the right side tire mark.

Near the rest position of the tires the evidence of ABS disengagement is not as pronounced.

The visible evidence in the tire marks of ABS braking marks is different from one content to the next and sometimes the evidence of such braking is not exactly clear. Whenever possible investigators should take close-up photographs of any tire marks in snow as early as absolutely possible since the possibility of important evidence being destroyed is quite probable. With detailed photographs in hand there is always the ability to study the evidence in further detail or to provide the evidence to a specialized expert for proper interpretation.









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