Pavement Marking Tape

Test Method Peel Force for the 90 Degree Peel Adhesion of Preformed Pavement Marking Tapes in the Field

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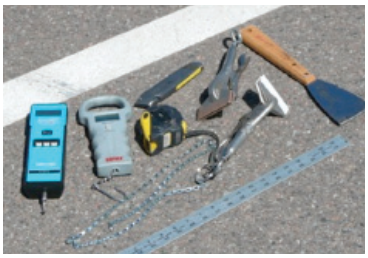
Introduction

This test method covers the measurement of the resistance-to-peel strength of an adhesive bond between the road pavement surface and a preformed pavement marking tape when tested at an angle of approximately 90 degrees and a low peel rate of about 12 inches per minute.

This test method also covers the rating of three characteristics of the peeled tape sample. These characteristics are useful in analyzing likely causes in any cases of poor or low resistance-to-peel strength.

Testing Equipment

Testing equipment consists of five components: a knife; a wide-blade scraping tool; a tape-holding or tape-gripping clamp, a strong, flexible chain; cable or cord; and a handheld tension gauge.



- Knife: capable of cutting through the preformed pavement marking tape, typically a disposable blade utility knife.
- Wide-bladed scraping tool: to help initiate removal of the tape from the road surface, typically a heavy duty putty knife, two inches to four inches wide.
- Tape-gripping clamping device: to securely hold the tape for peeling, typically a locking sheet metal tool, Vise-Grip (brand) from the Irwin Company, Model 8R, Item #23, with a 3⅛ inch jaw width. Replace the knurled turn bolt adjuster with a ¼-20 heavy eyebolt.
- Strong flexible chain, thin wire rope, cable or cord: typically a sash chain, approximately three feet long.
- Handheld digital tension gauge accurate to at least 50 lbs. A good quality digital fish scale is commonly used.

Sample Preparation

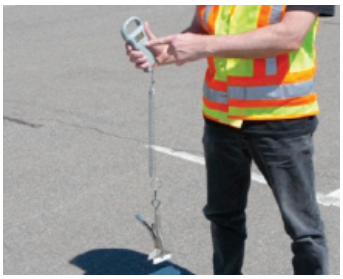
- A test sample consists of a preformed pavement marking tape properly applied to a road pavement surface in accordance with the manufacturer's recommendations or as required by a specification.
- Allow the test sample to develop an adhesive bond for about 10 to 60 minutes after completing tape application, including tamping for better accuracy. The test sample should not be allowed to develop an adhesive bond for more than about 12 hours because the adhesive bond typically increases slowly with time and additional tamping.
- For pavement marking tapes wider than six inches, cut a 4-inch wide strip about one foot long, using a straightedge and knife.
- To prepare the test sample, use a knife to make a straight and perpendicular cut completely through the pavement marking tape at the peel test location.
- Using a wide bladed scraping tool, loosen and peel a 1-inch to 2-inch long piece of one end of the tape sample from the road surface to form a short tab.

- If acceptable, for speed and convenience the tape tab can be folded on itself, adhesive to adhesive, to make a ½-inch to 1-inch long tab that will not stick to the clamp.

Equipment Preparation

- Using strong hooks, rings, clips or carabiners, suspend the clamping device from the digital tension gauge using a short length of flexible chain or cord. Adjust the length of the flexible chain so that the overall length of the apparatus is such that while the user is standing above the sample with the clamping device attached to the tape tab on the road surface, the digital tension gauge display is about chest high and easily visible to the user. As the tape is peeled from the road, the digital tension gauge display should continue to be visible to the user for several inches until the display height rises to eye level or above.
- Periodically, the digital tension gauge should be simply calibrated by first zeroing, and then measuring a known fixed weight in the range of five to 40 pounds and verifying that the measured value is within 2% of the known weight.

Test Procedure



- Using the instructions for the digital tension gauge, zero the gauge while suspending the gauge with the clamp and chain attached.

- Quickly enough so that the tension gauge continues to maintain its zero, insert the tape tab into the jaws of the clamping device and affix the clamp to the tape very securely.

- While standing astraddle the sample and holding the digital tension gauge with both hands, slowly lift the gauge straight up vertically to peel the tape from the road. The goal is to maintain a peel rate of 12 inches per minute, or one inch every five seconds. Practically, this is exerting a peel force just barely enough to peel the tape from the road, but no greater.
- Continue to slowly and steadily peel at least a 4-inch to 6-inch long section of tape from the road until the tension force readings fall into a consistent range.

- As the tape is being slowly and steadily peeled from the road pavement, but disregarding the first one inch of peeling, continually watch and record the tension force values about every one to two seconds. A good method to record the values is to repeatedly speak the values aloud every one to two seconds and have a partner record the values on paper or computer file. Another good method to record the values is to repeatedly speak the values aloud every one to two seconds into a micro cassette recorder and later transcribe the values to paper or computer file.
- Calculate the average value for the peel test as:

  Test Average = average of all recorded values (disregarding values during the first inch of peeling)
- Calculate and report the specific average value for that peel test in pounds per inch width (piw) as:

  Test Average, piw = (Average in Pounds) / (Tape Width in inches)
- Report the minimum and maximum values for the peel test in pounds per inch width (piw) as:

  Minimum, piw = (Minimum in Pounds) / (Tape Width in inches)

  Maximum, piw = (Maximum in Pounds) / (Tape Width in inches)
- If possible, it is good practice to conduct at least three peel tests separated by about 20 to 50 feet for each test location area on a project (each checkpoint area).
- If the tape tears or breaks during a peel test, average all the values up to the tear or break point and then also report "tape broke".
- If the force exceeds the gauge maximum, report "gauge maximum" and also report the value of the gauge maximum (for example "gauge maximum 50 pounds").
- At the completion of the peel test, cut through the tape at the end of the peel test in undisturbed tape to prevent initiation of future adhesion failure. Discard the test sample and replace it with properly applied new tape or, if acceptable, re-adhere the test sample with foot pressure or proper tamping.

Peel Test Ratings

Rate and record the three characteristics of the peel test described below by closely inspecting both the road pavement surface from which the tape was peeled and the adhesive surface of the peeled tape.

The three characteristics and the rating scales are shown below.

Adhesive Residue on the Pavement
(for example label as Adh Res 3 or AR 3)
Feel the pavement surface from which the tape was peeled with your fingertips and rate the percentage of the area that feels sticky. [Higher residue is usually better for durable tapes.]

(5 = 80-100% feels sticky)
(4 = 60-80 % feels sticky)
(3 = 40-60% feels sticky)
(2 = 20-40% feels sticky)
(1 = 0-20% feels sticky)

Tape Adhesive Area Covered with Contaminants
(for example label as Contam. Area 3 or CA 3)
Closely examine and feel the peeled tape sample with your fingertips and rate the percentage of the area that is covered with contaminants such as dust, dirt, sand, gravel or other debris and is not sticky. [Less contamination is better.]

(5 = 0-20% contaminated)
(4 = 20-40% contaminated)
(3 = 40-60% contaminated)
(2 = 60-80% contaminated)
(1 = 80-100% contaminated)

Size of Contaminants
(for example label as Contam. Size 3 or CS 3)
Examine the peeled tape sample and assess the average or typical size of the contaminants covering the adhesive, if any. [Smaller is usually better]

(5 = Dust)
(4 = Sand)
(3 = Small Gravel, – 1/16")
(2 = Gravel, – 1/8")
(1 = Small Aggregate, greater than 1/8")

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